

27, 1943

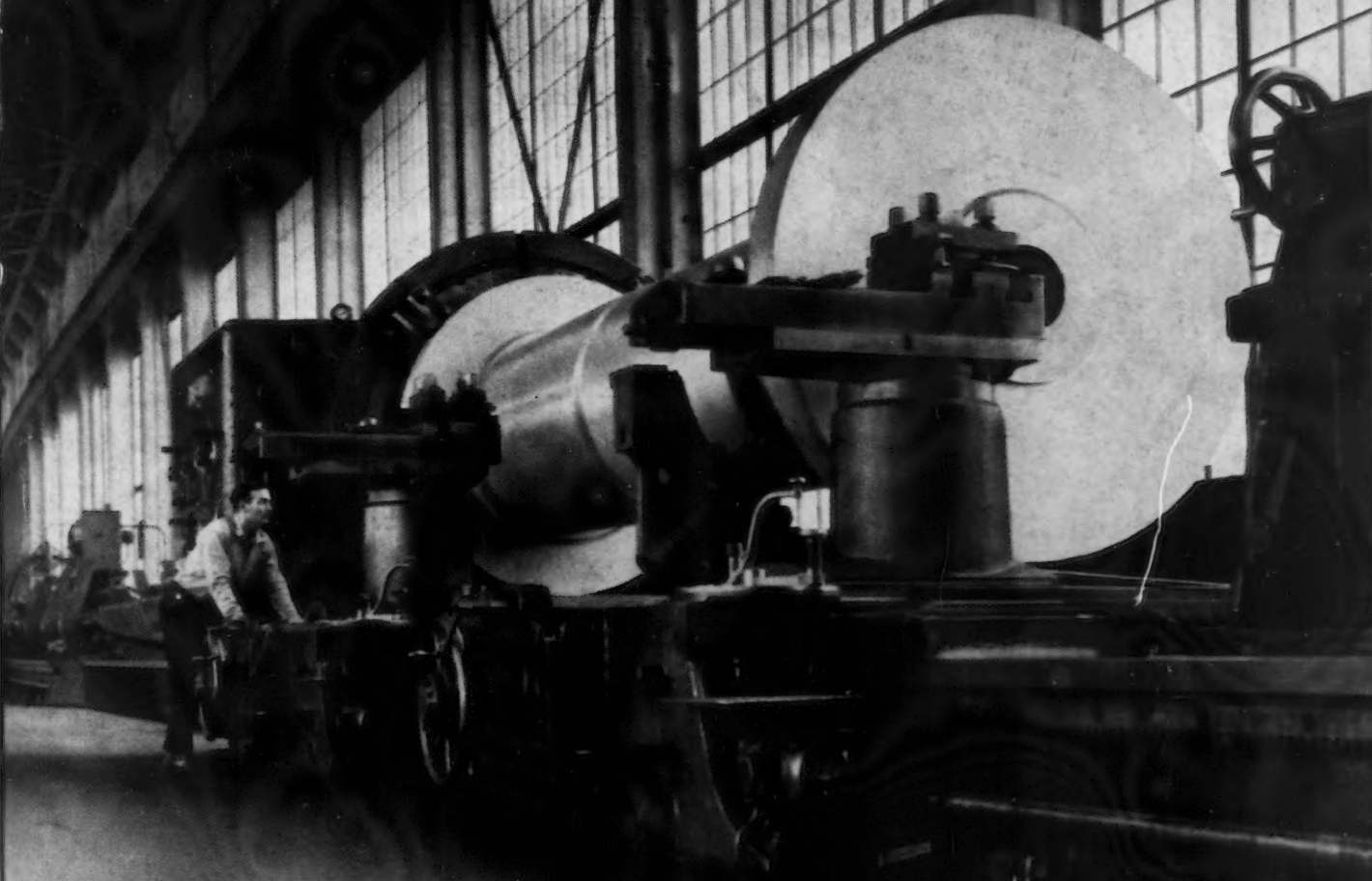
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THE IRON AGE

MAY 27, 1943

ESTABLISHED 1855



Repeated by Request

Senator Kilgore, of West Virginia, has introduced Senate Bill 702, proposing the appointment of an administrative agency to mobilize (?) our scientific and technical resources. Under this authorization, research and invention would be administered and controlled by Government.

To us this looks like an attempt to cross the New Deal donkey with the Technocratic mule. What Nature has found impossible to do may perhaps be accomplished by those who rush in where angels fear to tread.

Be that as it may, this proposal has brought us a number of requests to reprint an editorial published some years ago when the late but unlamented Committee on National Resources proposed to take all future inventions under its wing. Here it is:

HOW would the proposed National Board for the Forecasting and Control of Inventions, proposed by the President's Committee on National Resources, handle the case of the zipper, assuming that it had not as yet been invented?

The zipper, as you know, is that clever little device which takes the place of buttons and other fasteners. The zipper really has very large social implications, reverberations and repercussions; larger, perhaps than have steep angle airplanes or house trailers. Thus the zipper would probably come under the jurisdiction of such a board.

Let us sit into an imaginary board meeting, to consider the as yet (assumedly) unthought of zipper.

Chairman Whoozis: "Gentlemen, we are here to discuss the social implications involved in doing away with buttons. Some guy may think of this some day and we should be prepared to say 'yes' or 'no'."

Prof. Whyzis: "Excluding the nudists and the infants who are still in the safety-pin age, we have 115,000,000 people in this country using buttons. At a conservative estimate of 10 buttons per person, buttoned and unbuttoned once each day and an average time required of $\frac{1}{4}$ sec. for buttoning or unbuttoning each button, I arrive at the astonishing total of 57,500,000 man hours per year for buttoning and unbuttoning our buttons. Since one of the main objectives of the New Deal is to increase leisure among our people, I am for any invention which will save any considerable part of this tremendous amount of time. It looks to me like an open and shut proposition."

Prof. Howzis: "Considering this subject fundamentally from its impingement upon the sociological pattern as related to technological involuntary displacement, I desire to enunciate and emphasize the indisputable fact that 12,000 of our citizens are now gainfully employed in the manufacture of buttons; 14,000 individuals are employed in the correlated and adjunctive occupation of constructing button holes; 6,500 members of genus *homo Americanus* are occupied in attaching buttons to garments by means of thread or other fastening devices and 4,800 additional persons gain a livelihood through associated activities such as the manufacture, collection or transportation of the miscellaneous and diversified materials from which buttons are customarily fabricated. If, therefore, buttons were to be abolished, the resultant would eventuate in a gross maximum technological displacement aggregating 65,860,000 man hours per year premised upon the hypothesis of a mean, average, secular, interseasonal, integrated, progressive, occupational working week trend stabilized at 35 hours. Since one of the main objectives of the New Deal is to restrain the increase of unemployment, I am against any possibility such as would be concomitant with the invention under consideration. To me, it appears to be an open and shut proposition."

Mr. Lewzis: "Representing as I do the great masses of American organized labor whose throats are even now exposed to the cruel fangs of heartless monopolistic employers, I would be remiss to my duty did I not tell you that votes is votes. Since one of the main objectives of the New Deal is to get and keep the votes, I am against any possibility such as this, which is likely to alienate them. It looks to me like an open and shut proposition and I therefore move, Mr. Chairman, that the future invention of any such device shall be prohibited by law."



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Properties of Hardened Steels

By JOHN E. ERB

Works Laboratory, General Electric Co.
Schenectady

... Not a great deal is known about the physical properties of very hard steels and their reactions in service. Herein are a great deal of correlated data on this subject.

HARDENED steels are those which are placed in service with a surface hardness of 500 Brinell or more. In this condition they are practically unmachinable and, if finished at all, must be ground, lapped, or otherwise prepared

never be specified if ordinary material will do.

It is true that wear-resistance increases with hardness, but it is also true that certain combinations of the softer materials have excellent wearing qualities. This is indicated

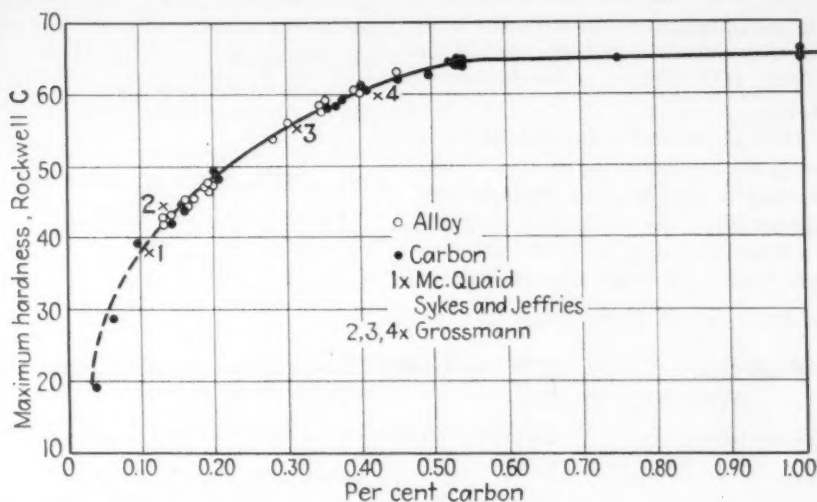
by Table I, based on results reported by Swift. Numerous instances are on record confirming the practical value of Swift's ideas, and the reliability of his results.

Properties

(A) Hardness: The relation between the carbon content and the maximum attainable hardness of steel is shown in Fig. 1.¹ Note that this hardness depends largely upon carbon, being practically independent of alloy content. The effect of alloys is chiefly to produce hardenability; that is, the ability to attain a maximum hardness with slower rates of cooling.

(B) Wear Resistance: The curves in Fig. 2, from Rosenberg, indicate the influence of carbon, and of hardness, upon the wearing qualities of plain carbon steels.

(C) Strength: Fig. 3 shows the relation between tensile strength and Brinell hardness. Note that the rule, "Tensile Strength = 500 x Brinell



for service. Steels which are hardened, whether plain or alloyed, may be classified as follows:

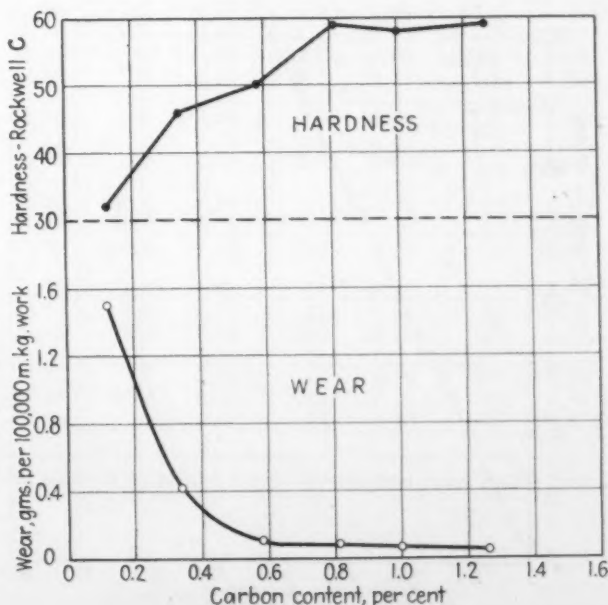
- (1) Case-hardening (mild) 0.25 per cent carbon
- (2) Tough-hard (medium) 0.50 per cent carbon
- (3) Hard (hard) 1.00 per cent carbon

Potentially, hardened parts are brittle, and may become a source of danger to equipment or personnel. Therefore the greatest care in design and manufacture is essential. Sharp notches, unbalanced sections, and "stress-raisers" of all kinds have a much more destructive influence upon hardened parts than upon those made from softer materials.

Hardening increases the cost and decreases the speed of production. Therefore hardened steel should

ABOVE
FIG. 1 — Relation between carbon content and the maximum attainable hardness of steel.

RIGHT
FIG. 2 — Influence of carbon, and of hardness, upon the wearing qualities of plain carbon steels. From Rosenberg, U. S. Bureau of Standards Journal of Research, September, 1931.



hardness,"⁷² holds good up to relatively high hardness values, provided the material is not brittle. Most steels containing more than 0.55 per cent carbon and which are over 600 Brinell hard behave in a brittle manner in the tensile test.

This fact is often taken to show that the tensile test is of no value in connection with hardened steel. However, even though the tensile may be low, this may be all the more reason to know exactly what it is.

The methods of stress analysis described by Gensamer³ demand that the tensile properties should be known, as the basis of sound engineering design. The same is true of the shear properties.

Woodvine⁴ has reported tensile tests of two kinds of case-hardened steel. Emmons⁵ and the Vanadium Alloys Steel Co.⁶ have published some data on the torsion (shear) properties of tool steels. Aside from this, though, this much-needed information virtually is non-existent.

Fig. 4 shows the relationship between hardness and compressive strength of hardened steel. Naturally, this curve represents samples which were hardened uniformly throughout.

The compressive strength of case-hardened articles will vary, depending on:

- (1) The nature of the load applied.
- (2) The hardness of the case.
- (3) The case-depth.

(4) The hardness of the core.

This is further discussed later on under "Relation of Case-Depth to Core Properties."

Tensile, bend, and Charpy impact tests were made, using notched and unnotched samples of representative case-hardened, tough-hard, and hard steels. The test specimens used are shown in Figs. 5, 6, 7, and Table II. The bend and impact tests are included for the sake of comparison.

Table II was prepared from data collected over a period of years, for the purpose of presenting a comparative picture of these three classes of steels, and to indicate which tests were significant and which were not.

It is perhaps unfortunate that some of the steels given are not representative of those in general use today. However, they are believed to be representative of their class, and it was comparison of classes and not individual analyses that was intended.

The "reduction of area" obtained from the ordinary tensile test at room temperature was used as the measure of "cold plasticity"—that is, the ability of the steel to be bent, formed, or drawn cold while in the annealed state.

"Hot plasticity" ("forgeability") is taken as the "reduction of area" when the test is conducted at temperatures approaching those used in forging. To those who may doubt the value of this "test," all that can be said is

that the results compare with forge shop experience. Most measurements of "forgeability" have involved the force or energy necessary to effect a certain deformation. However, to the writer this factor seems relatively unimportant. The reason is that, with modern presses and hammers, unlimited power can be brought to bear, the principal limitation being the ability of the metal to deform without rupture.

"Machinability" is indicated by the drill penetration—time test.⁸

The "hardenability" results are expressed in terms of the "Jominy" test. To those who are not familiar with the terminology used, it can be stated that the symbol J58=13 means that a hardness of 58 Rockwell C was obtained at a distance of 13/16 in. from the quenched end of the Jominy test bar. Or looking at it another way, this means that all sections smaller than 4 in. diameter, when oil quenched would develop 58 Rockwell C or better on the surface.

The mechanical properties results will become evident from comparison of the results with the different test specimens.

An explanation of the bend (modulus of rupture) test may be in order.

Sample specimen size may be $\frac{1}{2} \times \frac{1}{2} \times 4$ in., the load P being midway between the supports set 3.5 in. apart.

$$S = \frac{Mc}{I} \quad M = \frac{Pl}{4} \quad \frac{c}{b^3} = \frac{6}{b^3}$$

FIG. 3—Relation between tensile strength and Brinell hardness.

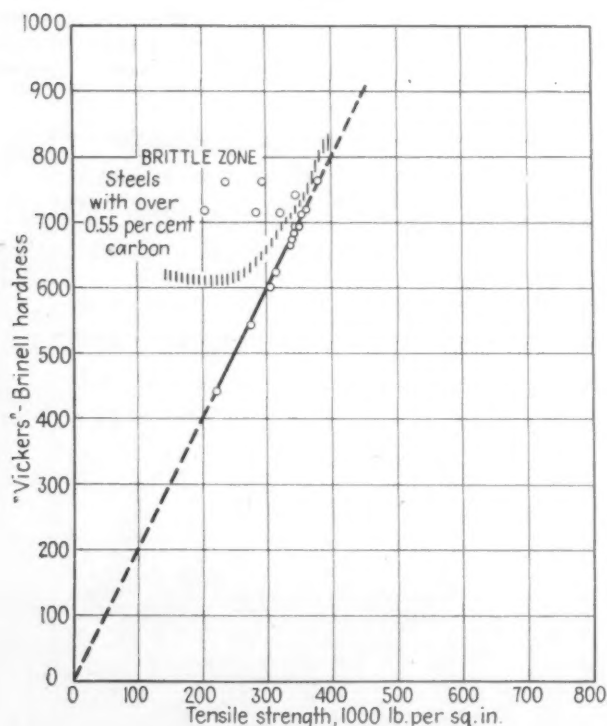
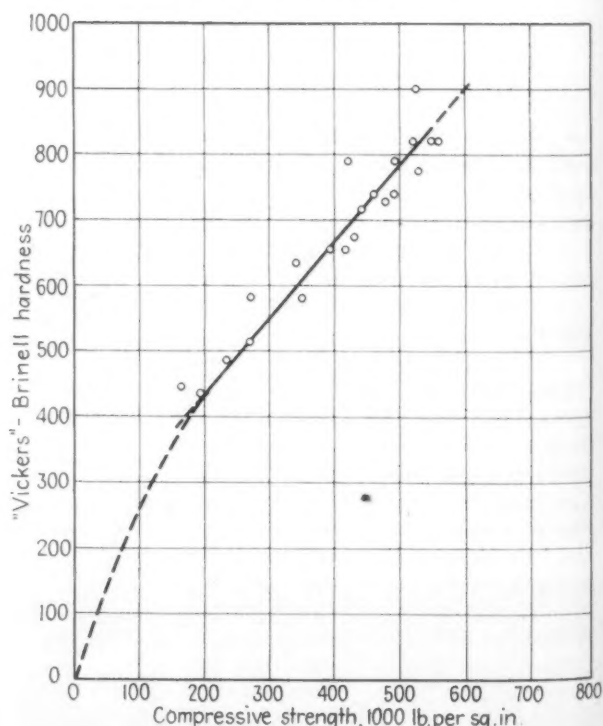


FIG. 4—Relation between hardness and compressive strength of hardened steel.



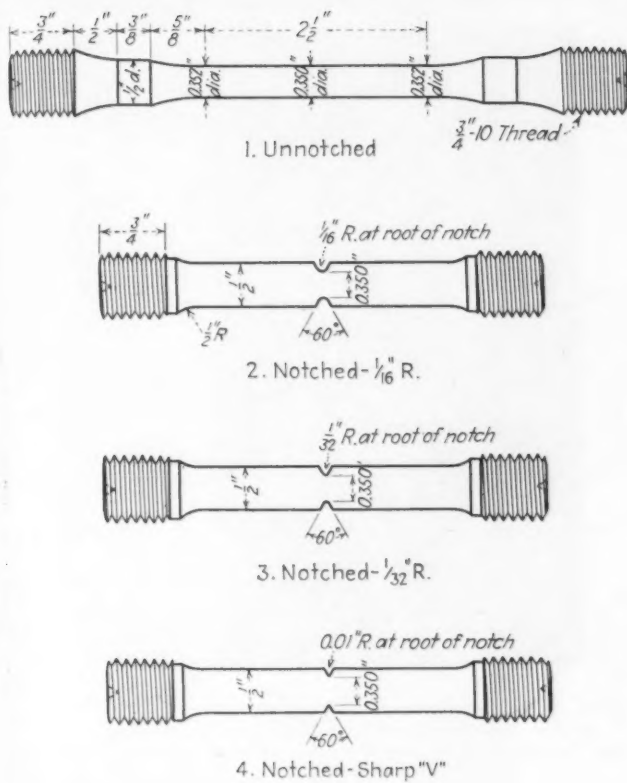


FIG. 5—Tensile test pieces, hardened steel. Test pieces 2, 3 and 4 are the same as the A.S.T.M. standard 0.505-in. tensile specimen, except for the notch.

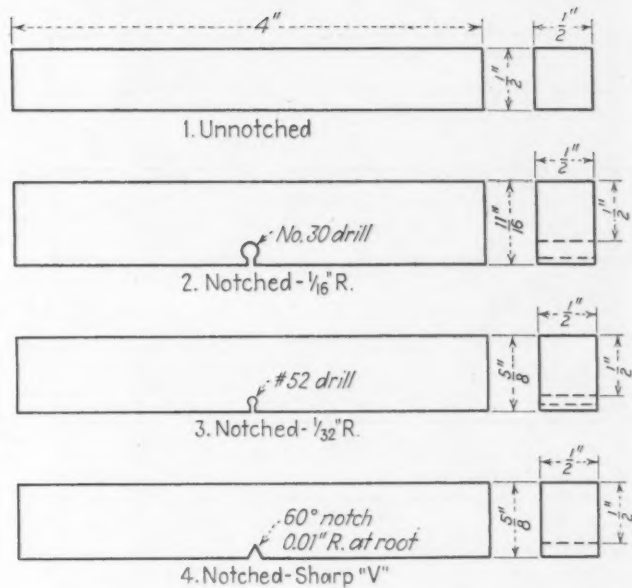


FIG. 6—Bend test pieces, hardened steel. When these are broken on 3 1/2-in supports, load at the middle, the modulus of rupture (S) is calculated for the breaking load (P) by the formula described in the text.

$$S = P \times \frac{7}{2} \times \frac{6}{\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}} =$$

$$P = \frac{7 \times 6 \times 8}{2 \times 4} = 42P$$

That is, the modulus of rupture (S) for this specimen is 42 times the breaking load (P). No allowance was made in the calculations for the

TABLE I
Wear of Metals in Sliding Contact

(H. W. Swift—"Engineering" vol. 131, June 19, 1931—Pages 783-785)

WEAR OF SPECIMEN

Material of Specimen	Pressure, Lb. Per Sq. In.	On Nitralloy W P	On Gear Steel W P	On Mild Steel W P	On Cast Iron W P	On Phos. Bronze W P
1. Nitralloy.....	10	1.4 0.55	3.7 0.70	4.3 0.65	1.2 0.65	0.5 0.70
	20	11 0.70	6.1 0.75	10 0.65	2.6 0.70	1.5 0.70
	30	27 0.80	7.9 0.55	11 0.65	2.2 0.60	2.2 0.65
	40	37 0.65	8.7 0.50	14 0.65	1.5 0.55	1.6 0.60
2. Gear steel (Hard—500 Brinell)	10	0.14 0.60	0.8 0.70	10 0.70	2.3 0.80	1.2 0.60
	20	0.67 0.60	14 0.70	14 0.70	12 0.80	1.7 0.60
	30	4.7 0.60	25 0.70	84 0.70	7.2 0.60	2.2 0.60
3. Mild (soft) steel.....	10	7.8 0.55	26 0.70	5000 0.75	21 0.70	14 0.60
	20	18 0.60	87 0.70	9000 0.75	84 0.70	18 0.60
	30	45 0.65	170 0.70	11000 0.75	200 0.70	22 0.60
4. Cast iron.....	10	32 0.55	32 0.75	1.3 0.70	38 0.75	12 0.60
	20	40 0.70	120 0.75	150 0.70	83 0.80	35 0.60
	30	67 0.75	290 0.75	330 0.70	8800 0.50	100 0.60
5. Phosphor bronze.....	10	15 0.65	0.4 0.70	27 0.60	65 0.70	370 0.55
	20	17 0.65	11 0.70	44 0.60	83 0.70	920 0.55
	30	19 0.65	26 0.70	58 0.60	54 0.70	1600 0.55

Notes: (1) W = wear of specimen 0.001 in. per million feet of travel. Determined by loss of weight of specimen every 28,000 feet. Tests run for 350,000 to 700,000 feet.
(2) P = Coefficient of friction.
(3) Speed = 80 r.p.m. = 120 ft. per min.
(4) Lubricant = none.

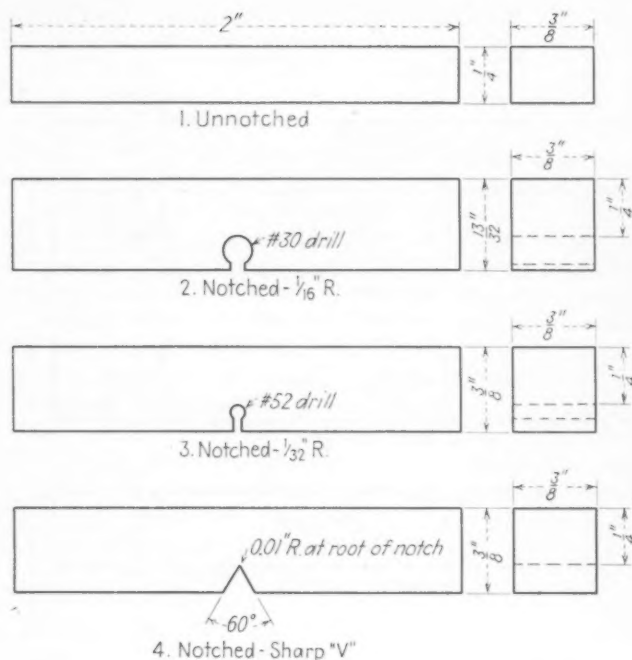


Fig. 7—Charpy test pieces, hardened steel.

notched specimens, since in all cases the areas above the notch for the notched specimens, and the cross-sectional area of the unnotched samples, were equal.

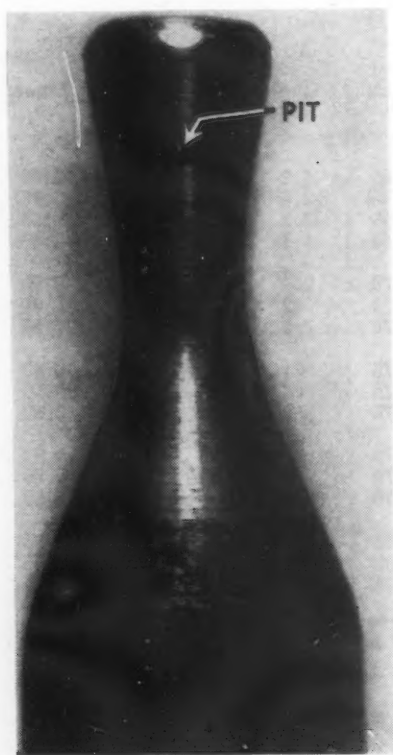
It is true that the formula applies strictly only up to the elastic limit of ductile materials and up to the breaking load only for very brittle materials (zero ductility).

For steels with appreciable ductility, such as the tough-hard, the formula gives fictitiously high results.

It is one of the purposes of this table to demonstrate this fact. (Compare tensile and bend results for the different steels.)

In the writer's testing of tool steels, the tensile test is used on tough-hard (0.50 C) steels and the bend on hard (1.00 C) steels.

During the tensile and bend tests



LEFT

FIG. 9—Showing pit in case hardened part subjected to heavy rolling (bearing ball) pressure.

RIGHT

FIG. 10 — Cold-drawn steel, bent cold. This shows crack revealed by magnetic powder method.

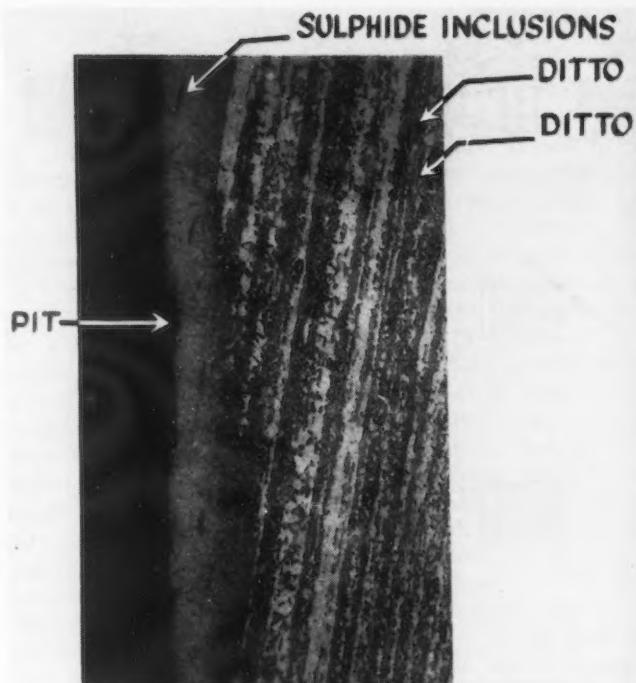
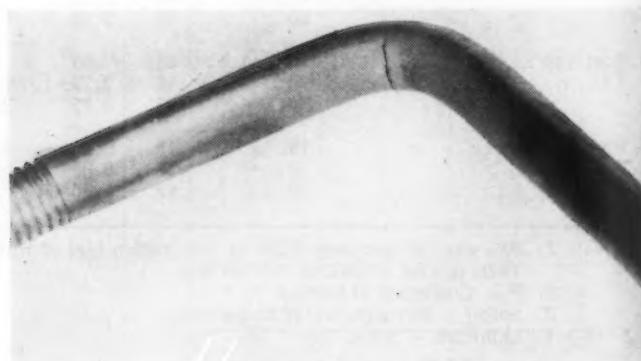
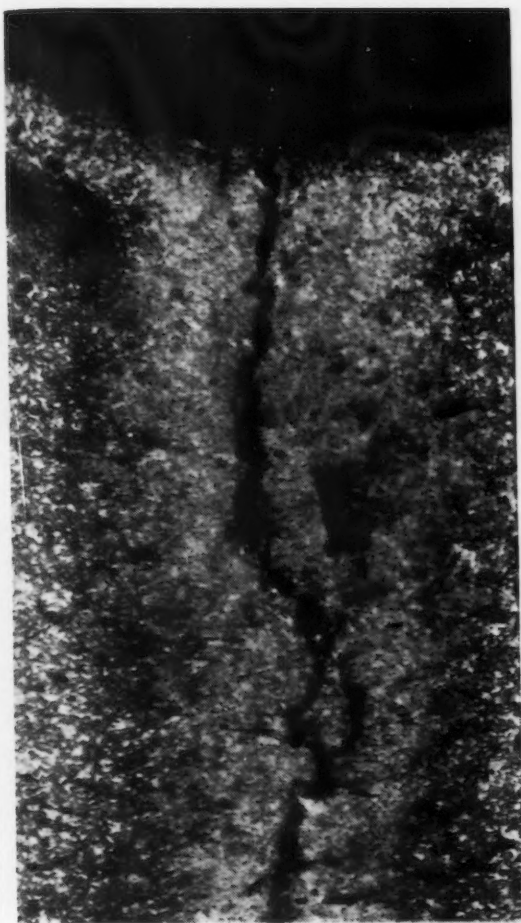


FIG. 8—Section of friction driver showing pit. Note the relation between the pit and the sulphide inclusions. The steel is SAE X-1112, case hardened (cyanide process) to a depth of 0.005 in.

of the case hardened samples, particularly those not so severely notched and with the "light" case, it was easy to see and hear the first crack, and subsequent ones, in the case before the specimen broke. All the unnotched tensiles, cyanide case hardened, were filled with parallel, evenly spaced, circumferential cracks in the case after rupture.

Unfortunately, when the tests were first begun, the significance of this was not realized and the values not recorded. It is the author's opinion that the stress at the first crack in the case, for such samples should be taken as the true point of failure, rather than the ultimate rupture stress.

One of the main purposes of this compilation was to show the utility of the ordinary tensile and bend tests as compared to what may well be the more elaborate and less significant



o o o

LEFT and RIGHT

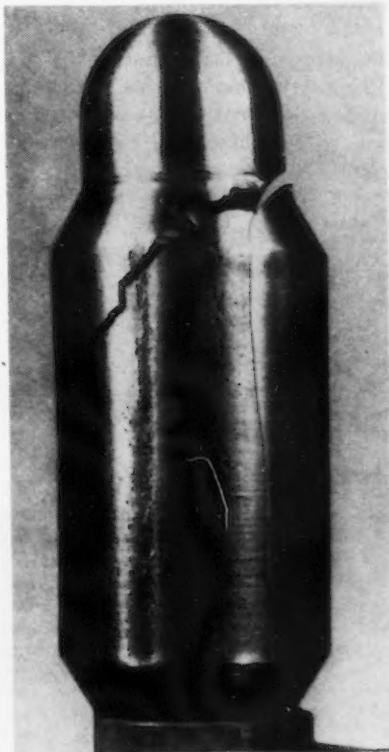
FIG. 11—Cold-drawn steel cracked by cold bending and then case hardened. This shows structure along the side walls and at the root of the crack. Heat treatment was case hardening in cyanide, 20 min. at 850 deg. C., then water quenched. Beginning of crack at left; end of crack at right.

o o o

BELOW

FIG. 12 — Large pivot cracked by failure to remove surface seams prior to hardening.

o o o



impact and fatigue tests. From the beginning, the effect of notches was strongly emphasized in impact or fatigue testing and almost disregarded in the more simple tests. Experience has convinced the writer that Gensamer is right—the simple tension and shear tests properly applied and interpreted are capable of results much more significant and reliable, and at a fraction of the time and expense.

Importance of Soundness

Cleanliness and freedom from physical defects are particularly important in material which is to be hardened. Pipe seams, flakes, and other gross defects cannot be tolerated. Certain items not ordinarily classed as defects may cause trouble in hardened parts.

High sulphur steels such as SAE-X1112 or X1315 contain manganese sulphide inclusions which give them their free-cutting qualities. Under ordinary conditions, these steels make excellent case-hardened parts. Under extreme pressures, however, the sulphide inclusions may cause trouble. A case in point is illustrated by Figs. 8 and 9, which show how pitting took place at a localized weak spot due to a sulphide inclusion.

Figs. 10 and 11 show a part made from cold-drawn steel, bent cold. This

formed a crack at the inside of the bend. The crack was so fine that it was almost invisible to the naked eye (until revealed by the magnetic test method). The part was later case-hardened. This rendered it so brittle

that it snapped when thrown on the floor. Note how the cyanide has penetrated to the root of this crack. The effect is much like putting a scratch on a piece of glass. Yet such parts if not cracked before case-hardened, will take considerable abuse without breaking.

Next to improper grinding, surface seams probably ruin more hardened parts than does any other cause. The trouble is that such seams are exceedingly difficult to see, unless detected by the magnetic test method, or some equivalent method.

Cracking Due to Surface Defects

The following finish allowance for hot rolled or forged material should eliminate all surface seams and other defects, if the material has been properly made.

Figs. 12 and 13 show a large pivot which broke in hardening because of failure to remove the surface. Presence of the seams was proved by the dark (oxidized) areas seen in Fig. 13. It is possible, however, that originally these were not as deep as shown, but were "opened up" by the process of heating for hardening.

In surface hardened articles, the desirable case depth will depend upon



LEFT
FIG. 13—Large pivot cracked in hardening. Presence of seams prior to hardening shown by dark heat-colored areas on fracture.

RIGHT
FIG. 14—Results of case hardening experiments with machine steels. Heat treatment: 825 to 875 deg. C., oil quench, tempered at 175 deg. C. for 15 min. Cyanide content, 30 per cent. Etchant, 2 per cent Nital. At 100 diameters.

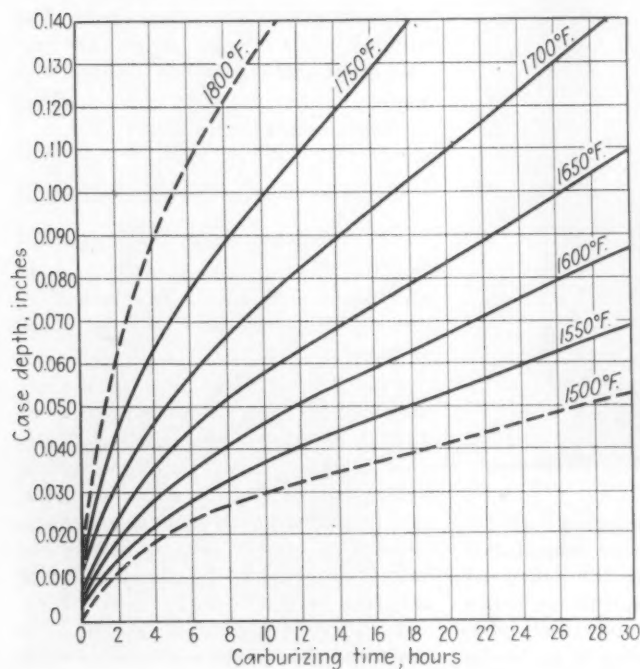
the working pressure as well as upon the hardness of the core. For example, when using a steel which develops a relatively soft core, such as X-1112, a greater case depth is necessary than when the base material develops more hardness.

Fig. 14 shows case depth obtained under production conditions, when samples representing three common machine steels were exposed to the cyanide bath for various periods of time. Note how the Rockwell C hardness value changes with depth of case on the different materials.

The foregoing study was made be-

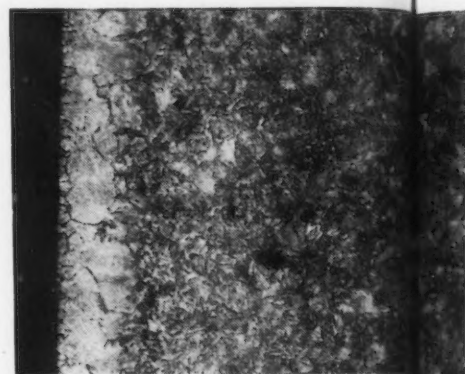
Diameter or Thickness	Minimum Finish Allowance on One Side
Up to 1/2 in.	1/64 in.
Over 1/2 to 2 in.	1/32 in.
Over 2 to 3 in.	1/16 in.
Over 3 to 5 in.	1/8 in.
Over 5 in.	3/16 in.

cause of trouble on a bearing surface. As originally made from SAE1020, cyanide case-hardened for ten minutes (R. C. 9-13), these bearings operated perfectly. However, when SAE 1112 was substituted for the above, using the same cycle, (RC(-4) - (-6)), the

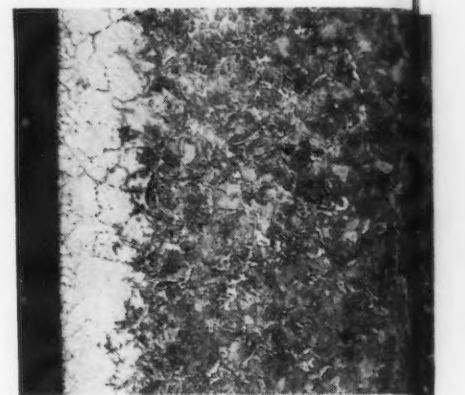


LEFT
FIG. 15—Representative curves showing relation of time and temperature to carbon penetration. All carburizing done in vertical gas retorts using natural gas (95-98 per cent methane) as the carburizing agent. All measurements made on triangular test pieces.

SAE 1020



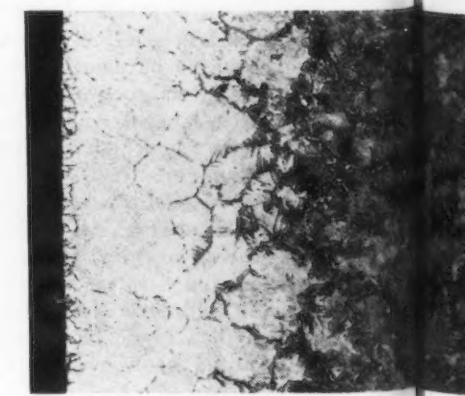
Rockwell C 10-13
Case depth 0.004"



Rockwell C 9-11 1/2
Case depth 0.004"

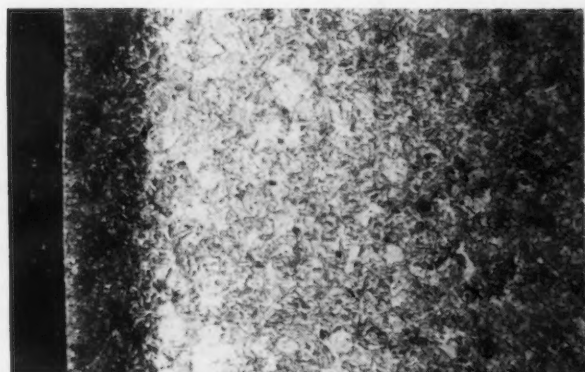


Rockwell C 37-38
Case depth 0.010"

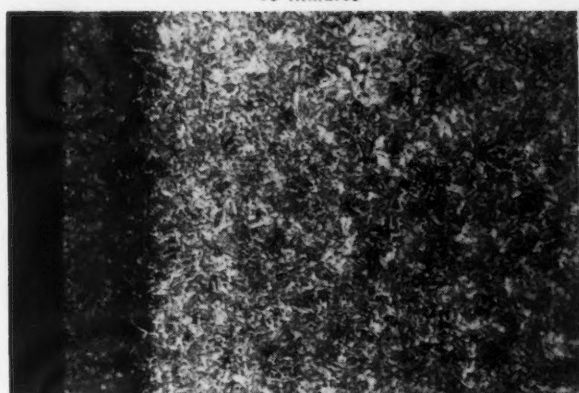


Rockwell C 37 1/2-46
Case depth 0.013

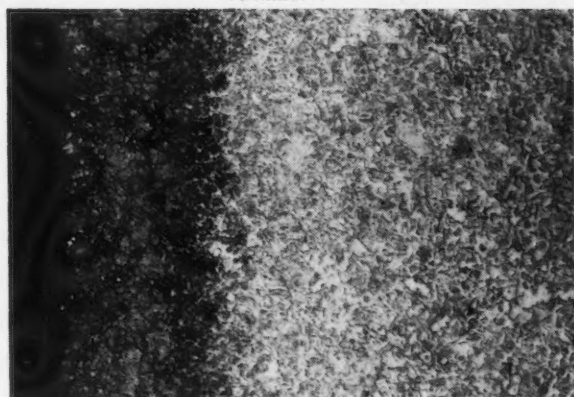
SAE X1112



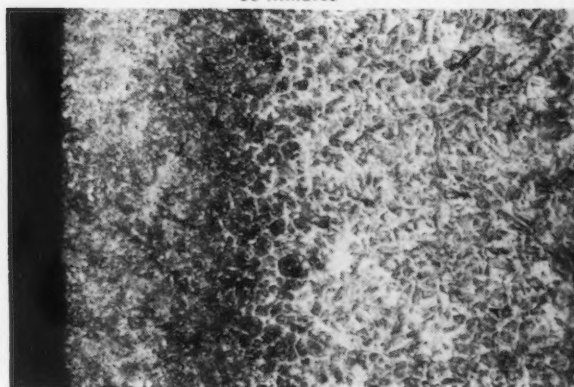
(-4) — (-5)
0.004"
10 Minutes



(-4 1/2) — (-5 1/2)
0.004"
30 Minutes

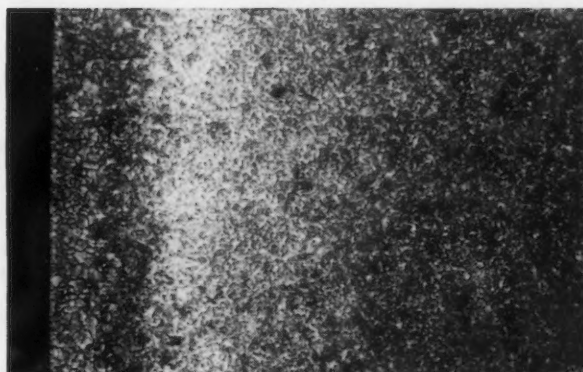


10 1/2 - 12
0.009
60 Minutes

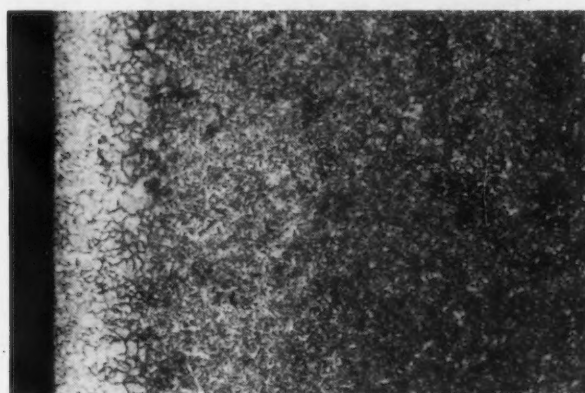


20-21 1/2
0.013
120 Minutes

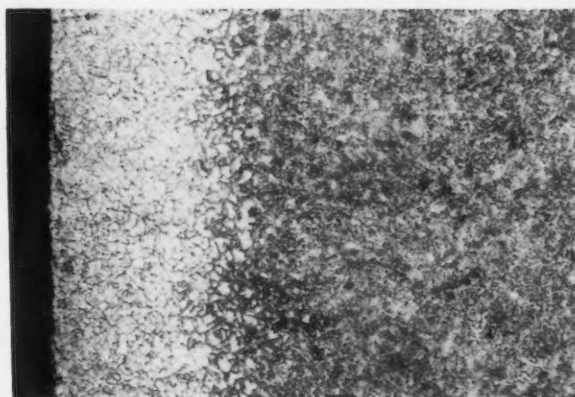
SAE X1315



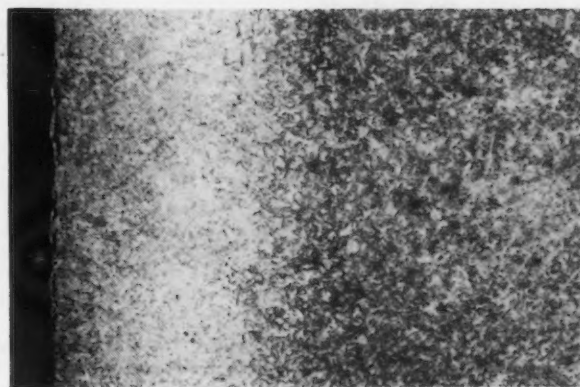
18-20
0.005"



19-24
0.005"



31 1/2 - 32
0.009



40-43
0.014

PROPERTIES OF HARDENED STEEL

TABLE II
Properties of Hardened Steels

Name and Specification	Case-Hardening		Tough-Hard		Hard	
	(A4119)	(SAEX1315)	(A9255) Modified	(SAE4140)	Carbon Tool Steel	Non-deforming Tool Steel (Steel B)
(1) Chemical Analysis.....	C 0.19 Mn 0.90 Si 0.21 S 0.026 P 0.017 Cr 0.64 Mo 0.30	C 0.17 Mn 1.45 Si S 0.11 P <.045	C 0.56 Mn 0.66 Si 1.91 S <.020 P <.020 Mo 0.32 V 0.17	C 0.40 Mn 0.75 Si 0.25 S <.050 P <.040 Cr 1.00 Mo 0.25	C 1.10 Mn 0.25 Si 0.20 S <.020 P <.020	C 1.05 Mn 1.75 Si 0.50 S <.020 P <.020 Cr 2.25 Mo 1.10 V 0.15
(2) Mechanical properties, annealed						
"Plasticity," cold, red. of area, 70 deg. F.....	61%	70%		50%	54%	
"Plasticity," hot, red. of area, 1650 deg. F.....	71%	97%			74%	94%
Machinability (SAE 1112) = 100 per cent.....	60%	92%	55%	55%	33%	31%
Welding.....	Good	Poor	Possible	Possible	Possible	Possible
Brazing or soldering.....	Good	Excellent	Excellent	Possible	Good	Possible
(3) "Hardenability"						
Normal hardening range, deg. F.....	1600-1700	1550-1650	1625-1650	1550-1600	1400-1500	1600-1650
Normal quenching medium.....	Oil	Oil	Oil	Oil	Water	Air
Normal hardness expectancy, Brinell,* surface.....	636-854	636-854	655-716	513-636	636-854	636-820
Normal hardness expectancy, Brinell,* core.....	170-400	150-300	400-716	300-636	301-513	636-820
Fracture grain size.....	5-8	5-8	9-10	5-8	8-9	9-10
Jominy distance to specified hardness, 1/16 in.	a J58 = 13	(a J58 = 8 b J60 = 8)	J60 = 12	J50 = 7	J65 = 1	Air Hardening
Largest diameter to develop specified hardness on Surface.....	O.Q.=4"	O.Q.=3"	O.Q.=3 3/4"	O.Q.=2 3/4"	W.Q.=12"	A.C.=4"
"Safety," size change, warpage, cracking.....	Good	Good	Good	Good	Poor	Best
(4) Mechanical properties, hardened						
Surface hardness, Brinell.....	763	763	695	546	805	763
Wear resistance factor (estimated).....	1.10	1.00	0.46	0.37	1.00	1.00
Tensile strength, lb. per sq. in.						
Unnotched.....	a 190,000	a 145,000	347,000	273,000	282,000	203,000
1/16 in. R notch.....	a 175,000	a 139,500	352,000			130,250
1/32 in. R notch.....	a 175,000	a 142,000				107,500
Sharp V notch.....	a 175,000	a 147,000	221,300			86,500
			Unnotched	Unnotched		
Unnotched.....	b 184,500	b 126,500	†243,000	†188,000		
1/16 in. R notch.....	b 212,000	b 159,000	‡6.0	‡10.0		
1/32 in. R notch.....	b 195,000	b 150,000	§15.8	§42.0		
Sharp V notch.....	b 198,000	b 153,000				
Bend strength, modulus of rupture, lb. per sq. in.						
Unnotched.....	c 206,000**	a 229,000	596,400		400,000	342,300
1/16 in. R notch.....	c 152,000**	a 191,000				154,350
1/32 in. R notch.....	c 124,000**	a 182,000	295,050			178,600
Sharp V notch.....	c 148,000**	a 170,000	228,900			91,350
Unnotched.....	b 214,000**	b 222,000				
1/16 in. R notch.....	b 232,000**	b 226,000				
1/32 in. R notch.....	b 307,000**	b 233,000				
Sharp V notch.....	b 269,000**	b 218,000				
Charpy impact, ft.-lb.						
Unnotched.....	a 10.3		161	150	6.5	9.1
1/16 in. R notch.....	a 6.0					6.7
1/32 in. R notch.....	a 5.3		14			2.9
Sharp V notch.....	a 5.0		4			1.5

NOTES:—

a = Pack carburized 1650 deg. F., 4 hr., 1/32 in. case. Direct oil quench.
b = Cyanided. 1550 deg. F. 1 hr., 1/64 in. case. Oil quench.
c = Pack carburized 1650 deg. F. 12 hr., 1/16 in. case. Direct oil quench.
* = Vickers or "true" Brinell.

** = Stress at first audible crack in case.
† Elastic Limit.
‡ Elongation %.
§ Red. of Area, %.

bearing balls sank into ("Brinelled") the surface, and "froze" there, ruining the operation of the device.

The relation of case-depth to time and temperature is shown by the curves in Fig. 15, from R. W. Schlumpf⁷.

Time, Temperature—Carbon Penetration

Although the curves in Fig. 15 are based upon gas carburized samples of SAE-3115 steel, it has been the writer's experience that, for most practical purposes, the same curves may be used for the pack-carburizing and cyanide case-hardening processes, and for all kinds of steel as well. Naturally, proper allowance must be made for the time required to heat the steel to the carburizing temperature.

In spite of numerous claims and counterclaims, it has also been the writer's experience that the wear resistance, strength, and other physical properties of cases produced by the different case hardening processes, whether gas carburized, pack carburized, cyanided, or by one of the numerous proprietary methods are, when all else is equal, equivalent.

Therefore, the choice of process

should depend more upon the depth of case, the production requirements, facilities available, and upon economics, than upon the rather mysterious "advantage" claimed for certain proprietary equipment, processes, and materials.

Summary and Recommendations

(A) The applications of the three classes of hardening steels are best indicated by a study of Table II.

(B) Case hardening steels are outstanding for ease of manufacture—forging, machining, cold plastic working, welding, brazing, etc. Furthermore, they combine high wear-resistance with very desirable resistance to weakening by notches.

(C) Tough-hard steel would appear to develop maximum tensile and elastic properties in unnotched or mildly-notched designs.

(D) Hard steel is indicated only for parts such as bearing-balls, which are subjected to compressive loads beyond the capacity of case hardening or tough-hard materials.

(E) Close co-operation between designer, planner, production man, and heat treater is essential for success with hardened materials.

Finally, drawings, as well as plan-

ning and production arrangements, should leave no doubt as to:

(1) Material.

(2) Hardness desired, not only how much, but where.

(3) Depth of case if part is to be surface hardened.

(4) Allowance for warpage, size change, and decarburization (finish allowance).

(5) Special requirements, if any.

References

- ¹"Quantitative Hardenability," by Burns, Moore and Archer, Trans. A.S.M., 1938, p. 14.
- ²"The Marked Similarity in the Tensile Properties of Several Heat-Treated Alloy Steels," by E. J. Janitsky and M. Baeyerztz, Metals Handbook, A.S.M., 1939 edition, pp. 515-518.
- ³"Strengths of Metals Under Combined Stresses," by Maxwell Gensamer, A.S.M., Cleveland.
- ⁴"The Behavior of Case-Hardened Parts Under Fatigue Stresses," by J. G. R. Woodvine, British Iron and Steel Inst., Carnegie Scholarship Memoirs, Vol. XIII, 1924, pp. 197-236.
- ⁵"Some Physical Properties of Hardened Tool Steel," Proceedings A.S.T.M., vol. 31, 1931, p. 47; also "Some Physical Properties of High Speed Steel," by J. V. Emmons, Trans. A.S.S.T., February, 1932, p. 289.
- ⁶"Tool Steel Data Book," 1941, Vanadium Alloys Steel Co.
- ⁷"The Mechanism of Carburization," by R. W. Schlumpf, Metals Handbook, A.S.M., 1939 edition, Fig. 5, p. 1041.
- ⁸H. T. Pentecost, THE IRON AGE, Oct. 19, 1939.

Electron Microscope Improved

THE Siemens electron microscope has recently been improved according to the German "TZ für praktische Metallbearbeitung," and it is said that the instrument has now reached such a degree of perfection that marked further improvements cannot be expected. The microscope can be operated by the layman after a short instruction period. All special fixtures are in one cabinet and do not need to be serviced. All necessary manipulations can be performed by the observer on the operating stage without endangering himself by working near high tension wires.

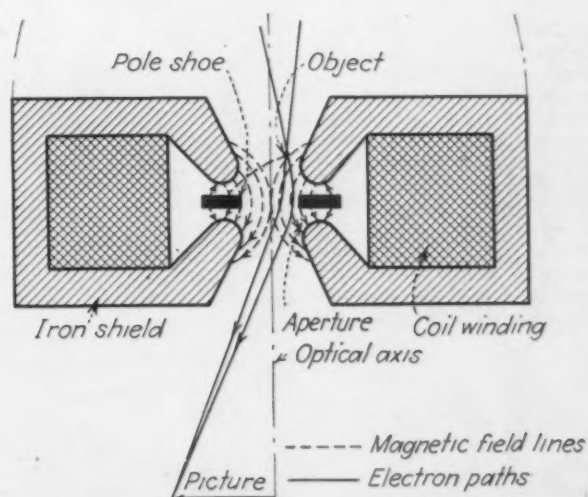
The presentation of the object has been greatly facilitated by a new object stage, consisting of a particularly transparent material, special collodion films of about 0.02 μ (0.00002 mm.) thickness.

Three electro-magnetic lenses are used instead of the former two. The principle of the lens is shown in Fig. 1. Direct current flows through the coils, considerably increasing current energy. Since the lens body has been kept circular, this current energy

has the effect of concentrating the invisible electron radiation and forcing it through the fine opening between the pole shoes of the lens whereby the magnetic lens is formed. By changing the strength of the current, the focus of the lens can be adjusted and the degree of magnification varied within wide limits.

The magnifying power of the microscope has been increased to 40,000 diameters, and can be adjusted down to 4000. (The optical microscope has a maximum magnification of 2000 diameters.) Photographic magnification of a clear electron picture can enlarge the size of the original object to 200,000 diameters.

P RINCIPLE of operation of the electromagnetic lens of the electron microscope. By using such lenses in series magnifications up to 40,000 diameters can be obtained.



Menasco Makes Landing



IN these and following pages are shown a sampling of some of the tooling and special machinery installed by the Menasco Mfg. Co., Burbank, Cal., for the production of oleo landing gear struts for the P-38 Lockheed Lightning fighter plane. With few exceptions, the equipment is brand new inasmuch as machine tools for the production of light aircraft engines, the company's former product, could not readily be converted for this special work.

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LEFT

AFTER the solid forging for the main strut has been centered and rough turned, it is drilled from the solid in this Barnesdril No. H-4 Hydram inverted drilling machine. The hole being drilled is over 4 in. in diameter and is 28 in. long. The huge drill remains stationary and the work is both rotated and fed down over the drill. Head with chuck and lower steadyrest are fed hydraulically. The entire machine is over 20 ft. high.

o o o

RIGHT

CONTOUR turning of the strut cylinder is done semi-automatically in this Monarch lathe especially fitted with a cam bar on the rear in place of the regular taper turning attachment. An extension of the cross slide carries a follower roller which is held against the cam by an air piston and toggle action. Cemented carbide is used to turn this alloy steel forging.

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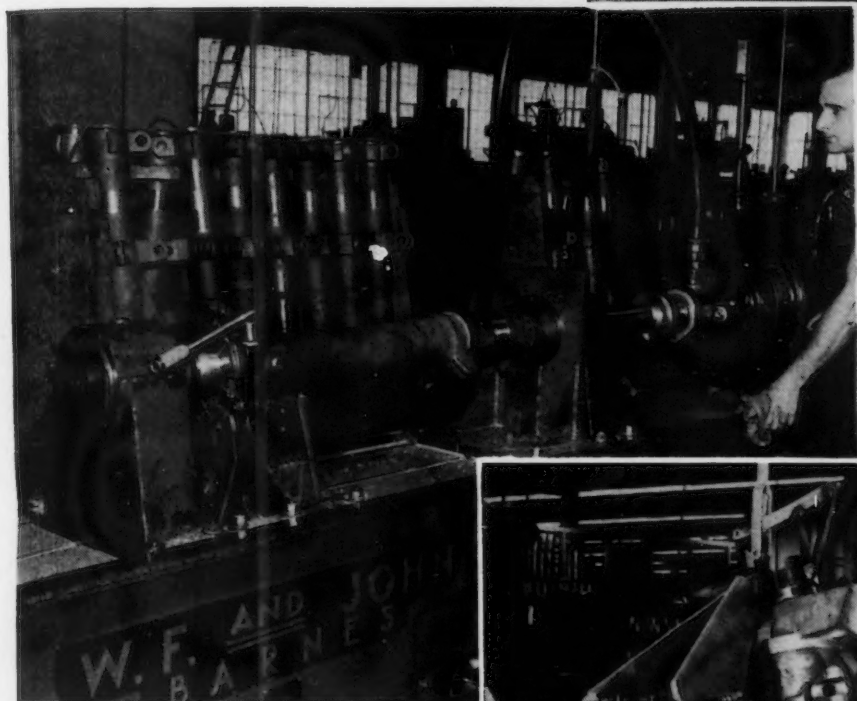


ing Gear Struts . . .



ABOVE

WHEEL attachment fittings and yoke lugs are arc welded to the piston tube in this elaborate positioning jig, which assures correct location of the lugs with respect to each other. The entire fixture is rotated about trunnion bearings.



ABOVE

BORING the main shock strut cylinders in a W. F. & John Barnes hydraulic boring machine. Note the elaborate type of saddle-clamp used to grip the outboard end of the workpiece. A large volume of coolant under pressure is pumped through the boring bar and carries the chips out through the base of the pedestal at the left.

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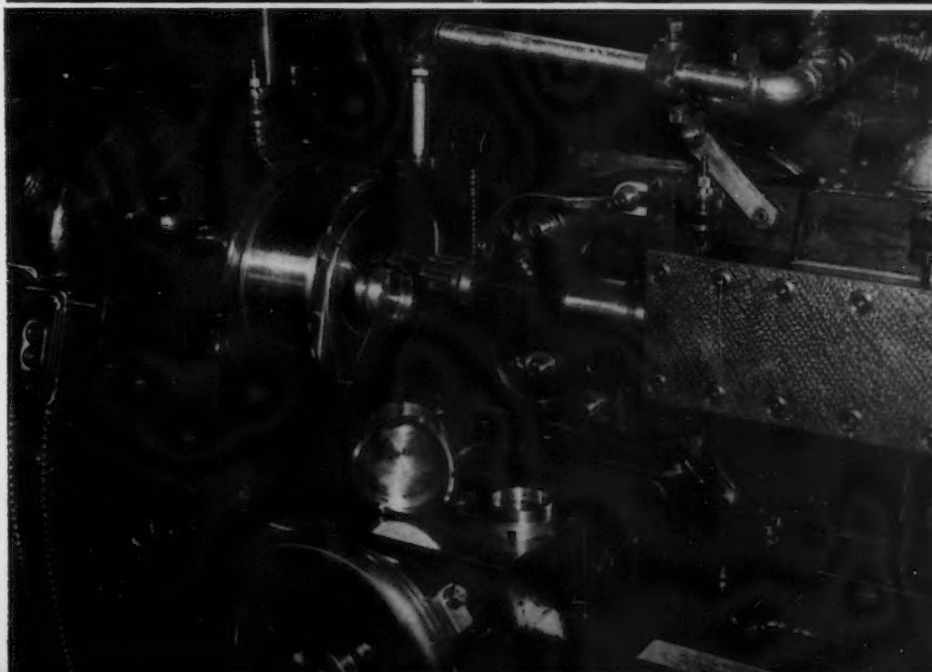
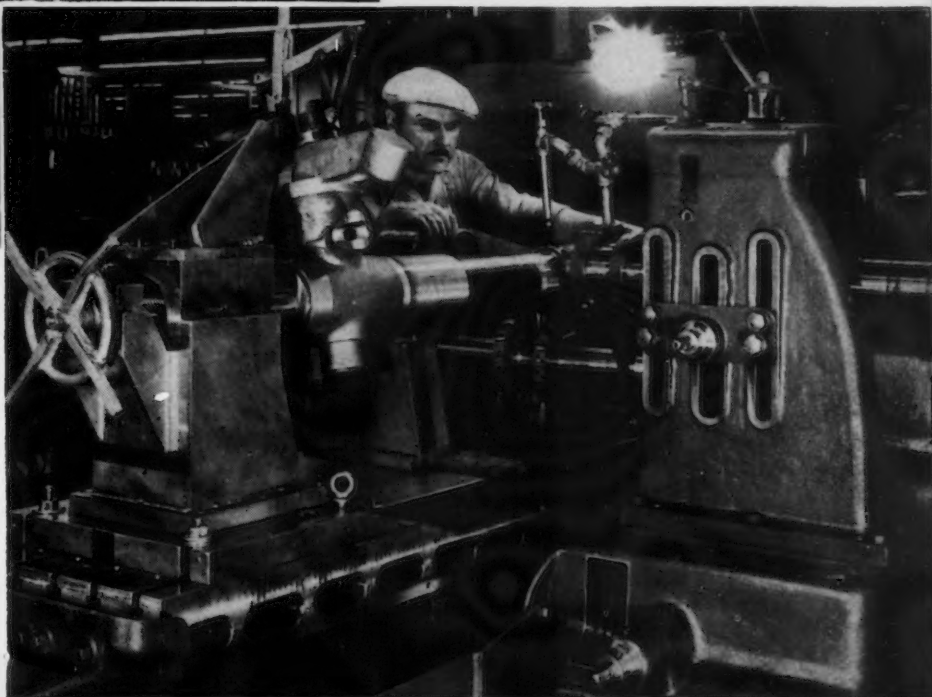
RIGHT

THE most elaborate milling machine jig in the plant is the one used for supporting the main strut while the up-lock attachment lugs are being straddle milled in this manufacturing type Milwaukee miller. This intricate forging is rested on the pedestal until an end plug is screwed into position with the handwheel at the left. Radial positioning is obtained with the V-block and toggle clamp shown at the upper left.

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LOWER RIGHT

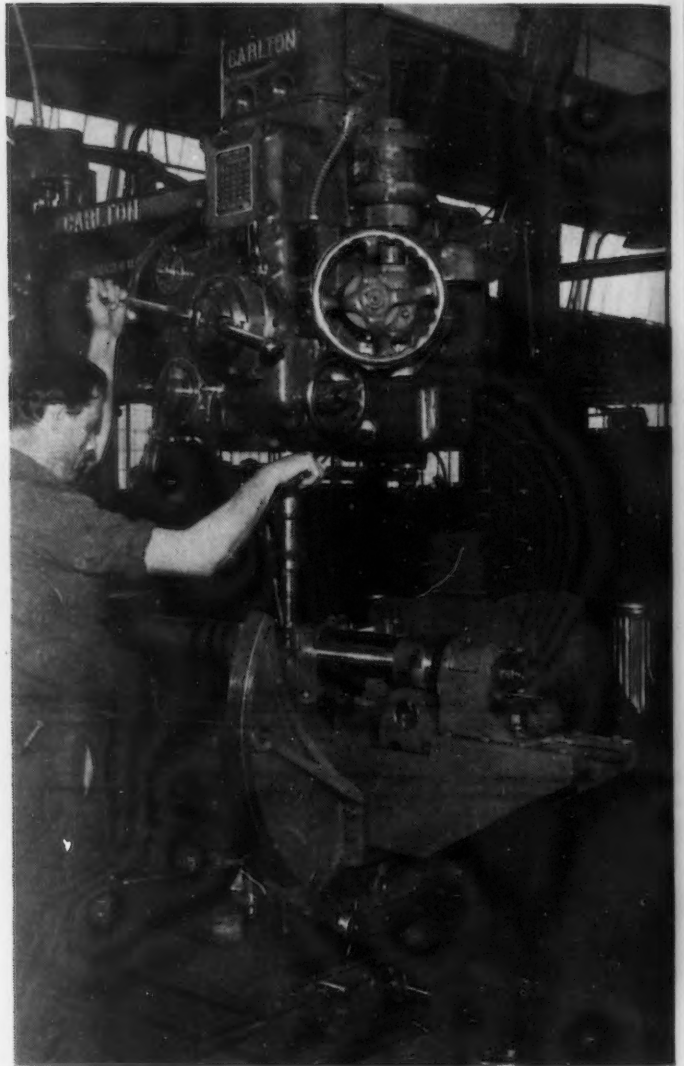
Thread milling operation on a plug cap for the main strut. This is done on a Lees-Bradner thread miller.



◆ — MENASCO MAKES LANDING

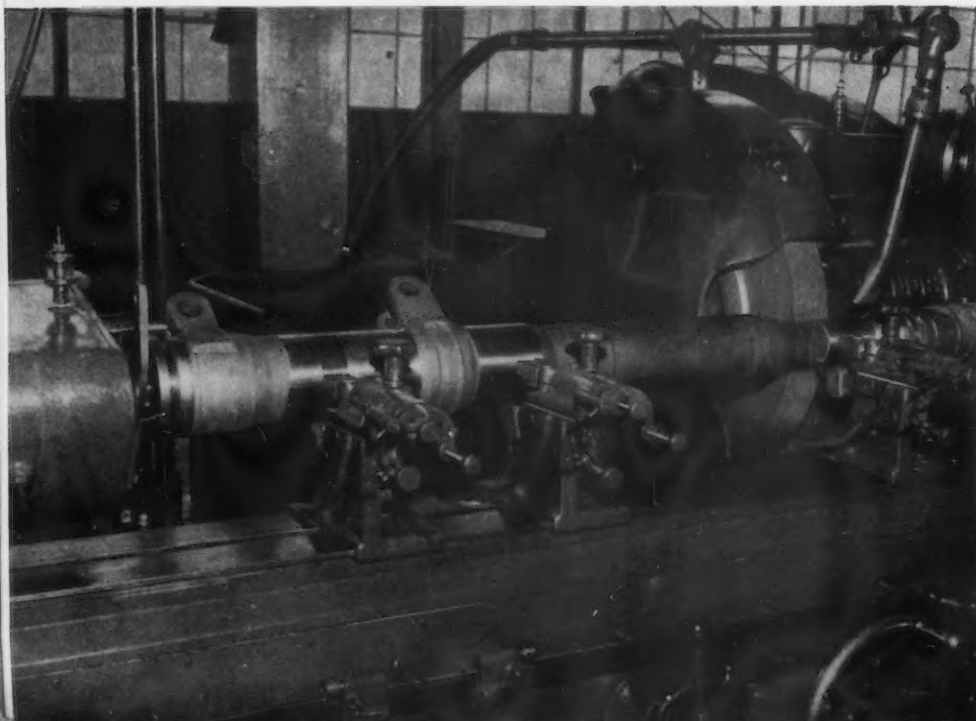
BELOW

SHOCK strut attachment lugs being drilled in an intricate trunnion jig mounted on the bed of a Carlton radial. After the operation shown is completed, the carrier is rotated 90 deg. counter-clockwise and locked with an index pin. Then the whole fixture is moved forward a few inches on its base, location being by the index plug shown in the central foreground.



ABOVE

AFTER all machining operations on the strut bodies and pistons are completed, the forgings are hardened. This view shows two of the GE electric furnaces which bring the work up to the quenching temperature. In the rear may be seen one of the hoods into which the work is hoisted prior to transfer to the oil quench tanks. The furnace atmosphere fills these containers and keeps the work from scaling during the transfer interval.



LEFT

AFTER hardening and sand blasting, the first operation on the strut cylinder is cylindrical grinding, performed in this Landis unit. Note the liberal use of steady-rests on all the important diameters.

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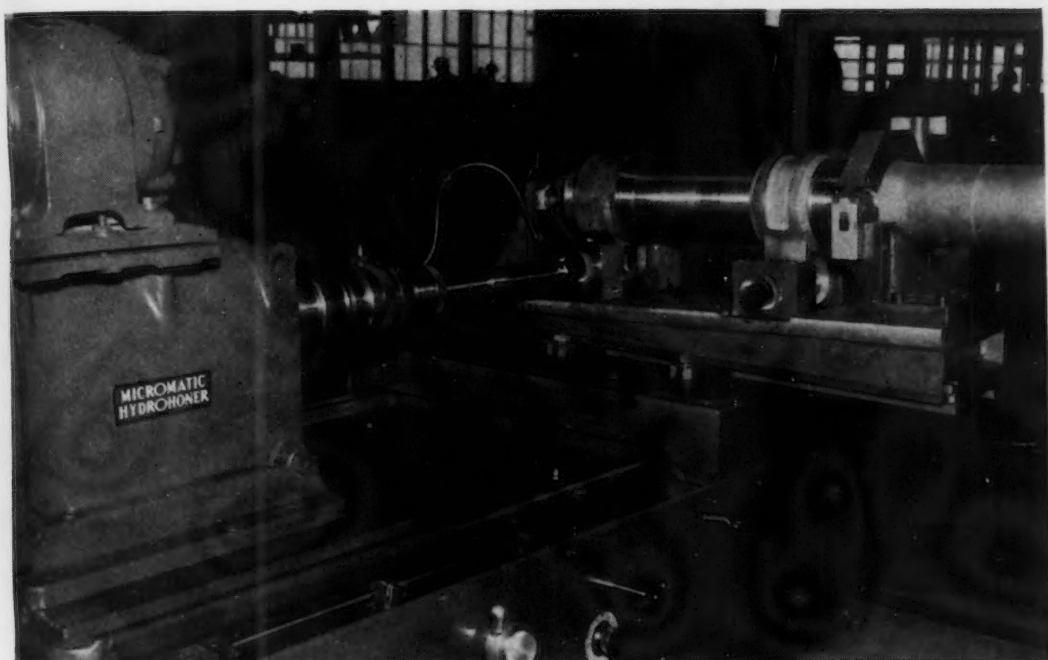
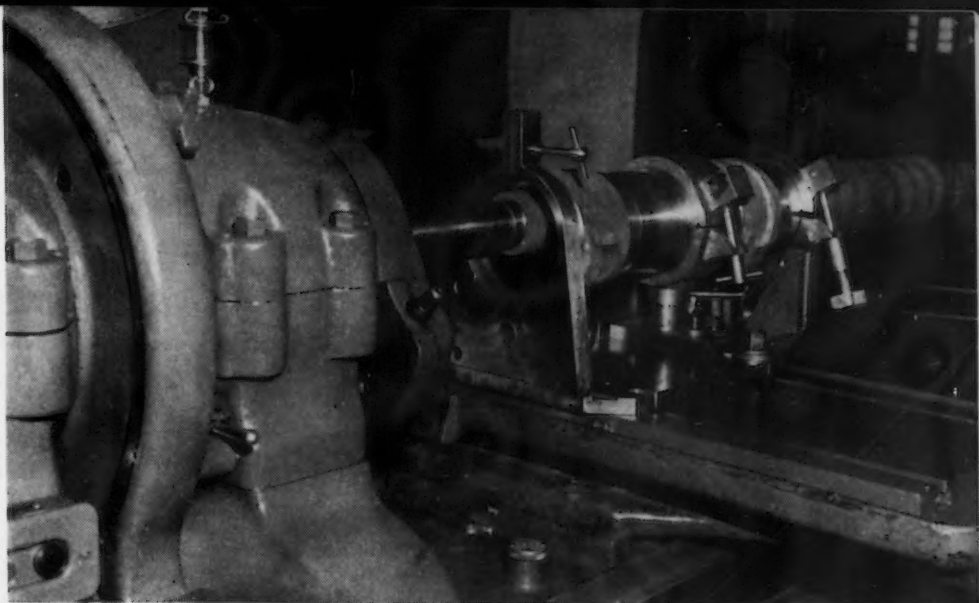
GEAR STRUTS —————

o o o

BELOW

ATTACHMENT lug holes are accurately sized and finely finished with this Micro-matic Hydrohoner. Because the holes are relatively shallow compared to their diameter, the stone holder is piloted front and rear. The complete cycle is automatic. Like many other toolings at Menasco, this simple but sturdy jig is an excellent example of arc welded construction.

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ABOVE

GRINDING of the packing gland inside diameter in the main strut cylinder is done in a Heald planetary type of internal grinder. The work is clamped rigidly in the special fixture shown and is given a longitudinal feed motion only.

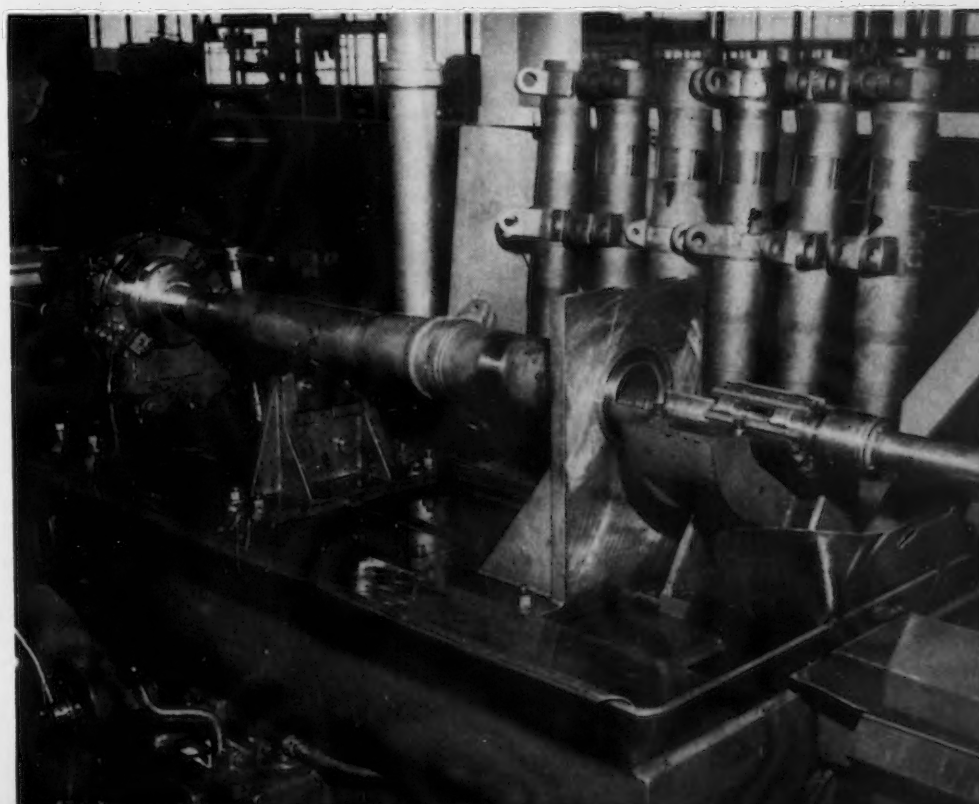
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RIGHT

THE interior of the strut cylinder is shown being honed in this W. F. & John Barnes horizontal type honer. Similar operations are also performed on Barnesdril vertical type machines.

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Soldering Aluminum

DESPITE the advances in the aluminum alloys and their usage, advancement in methods of joining has not always gone ahead with the same alacrity, the British *Light Metals* points out in a discussion on the theory and practice of joining light metals. The most common methods have been riveting, bolting and flame welding, and, to a lesser degree, arc welding. Resistance welding, in particular "spot" welding, has now attained a sound position that inspires confidence, but has taken a long time to gain this state when compared with the same process for the steels.

Soldering has not yet acquired the universal importance that it has with the majority of metals, particularly the coppers and brasses.

The real problem in soldering light alloys concerns the quick-forming natural oxide film upon their surface and its elimination. A technical problem and supposed objection is the formation of a bimetallic joint between the highly electropositive aluminum and the usually electronegative "solder." In many cases, this is the real objection, but often it is the excuse for failure to solve the practical problem efficiently. However, in order always accurately to judge this, it is felt that what is meant by "soldering" requires definition and that accepted practices in soldering other metals justify examination.

The term "soldering" generally implies a process of joining two metals or metallic components using a molten metal "cement." Metallurgically, a little more than this is required; the molten joining metal must wet the complete area of both mating surfaces and must alloy, at least superficially, with the parent metals. The strength of the junction is that of the joining metal, except in exceptional cases where the joined surfaces are in intimate contact and a mere film of joining metal alloys with the two surfaces simultaneously. These exceptions are becoming the rule in some modern processes, for example, fur-

nace brazing of steel parts with copper which enters the junction by capillarity and the extension of the principles of this mode of assembly to soft soldering and silver brazing of brass and other alloy components. In all cases it will be noted that the solder is of lower melting point than the metals joined.

Soft soldering uses binary alloys of tin and lead, although these may be modified with additional alloying elements in small percentage, for example, antimony, cadmium, silver. They generally melt within the range 350 to 480 deg. F., with operating temperatures of 430 to 660 deg.

Hard soldering and various brazing processes use higher melting point alloys. Brazing brass is the oldest and most typical, with melting point of about 1110 deg. F. although today various silver solders are widely employed. These are chiefly alloys of silver and copper, or silver, copper and zinc, melting between 1290 and 1920 deg. F. Lower melting alloys, down to 570 deg., of silver and tin are also used to bridge the range between soft solders and brass brazing alloy. Copper itself is used for furnace brazing of steel in controlled atmospheres.

Flux Compositions Used

Active fluxes are used with all these alloys. Flux must be completely removed after soldering by a separate washing operation, otherwise virulent corrosion occurs with early failure of joint. When such washing cannot be applied due to the nature of the assembly, either a modified flux of less corrosive propensities must be used and the risk from some corrosion accepted, or a non-corrosive flux must be employed. In this case, work surfaces must have been pretreated, usually prior to assembly, to render such a mild flux effective in removing superficial oxide films.

Apart from strength and working temperatures determining the type of solder to be used, practical factors of base metal composition, surface condi-

tion, actual composition of solder within a given type range, flux composition, method of application and working temperature have to be studied in relation to one another, and the correct balance of conditions obtained.

It is important to note these factors, because recent researches have established their inter-relationship in the case of aluminum alloys.

A brief resume of soldering facts shows:

- (1) The existence of a wide range of solders and soldering fluxes.
 - (2) Choice of solder depends upon the job and the requirements of service.
 - (3) Low and high melting solders are both used for all metals independent of the melting point of the latter (except, of course, this cannot be below the soldering temperature).
 - (4) Fluxes have to be used.
 - (5) Ordinary fluxes are strongly corrosive and must be washed free.
 - (6) Special non-corrosive fluxes are used, but in general can only be conveniently used in conjunction with preparatory precautions.
 - (7) Bimetallic junctions result in practically every case.
 - (8) Broadly speaking, outside the light-alloy series, it is assumed that most metals can be soldered with all types of solder, and conditions are found for precise solder compositions, flux and operating conditions to produce an efficient, serviceable junction.
- The aluminum alloys are admittedly a more difficult proposition than the brasses and steels, despite the fact that, under normal conditions, they do not readily corrode, and they reach the soldering stage in a cleaner condition than the general run of ferrous and non-ferrous work. The trouble is that the natural oxide film is more difficult to remove than is tarnish from non-ferrous or rust from ferrous metals. But it can be simply removed as is demonstrated by the range of preparatory treatments developed for

Alloys

... This British discussion on the theory and practice of joining aluminum light alloys refers particularly to soft soldering. Brazing of aluminum is also investigated, as well as progress made in dip soft soldering. The extreme emphasis laid in the past on corrosion dangers is questioned.

electroplating (for example, nickel dips, sodium-zincate treatments, etc.). Further, aluminum is more highly reactive than the other metals soldered, and more readily ruined by retained fluxes. Again, electroplating practice shows that retained chemicals can be washed free. For similar reason, aluminum is more prone to failure from bimetallic contacts, but long service from soldered joints under arduous conditions, even in domestic utensils, such as tea-pots in which spouts are soldered, establishes that at least some solders are reliable.

Bimetallic Corrosion Problems

On this subject of bimetallic corrosion, naturally the truest results are obtained from service experience only, and the closest prediction by test can only be hoped for by closely simulating service conditions in the test set up. Some information can be obtained from electrode potential values. Those given in Table I were measured at 77 deg. F. in artificial sea water with the metal against a normal calomel cell.

A "safe" combination of metals in contact is usually regarded as one giving a disparity of potentials not exceeding 0.25 volt. The table is set out to show the potentials of the normal basis materials and the principal ingredients of the alloys used for joining; it also shows similar data for the light alloys.

It can be seen that for the steels the soft solders should be "safe," but that these solders are on or beyond the border line for the copper and nickel alloys. The silver brazing solders, without zinc or tin, are on the border line for the steels, but within limits for the copper and nickel alloys; the same applies to copper as the brazing material.

Regarding the light alloys, the reason for the choice of zinc-base soft solders becomes obvious. While tin is rather low for potential value, the higher zinc-content alloys should compensate this to a large degree, but straight zinc-cadmium alloys should

prove nearest to the ideal. With the hard solders, an alloy of somewhat lower melting point than the aluminum alloy to be joined has to be selected and no difficulty from the potential angle should arise.

This consideration of potentials has been only superficial, but sufficient evidence has been presented to show that in normal soldering spheres bimetallic junctions are involved and electrochemically the disparity between the metals at such junctions may be quite marked. With aluminum soldering, the disparity need be no greater and in many cases smaller. Consequently, the seriousness of this point must not be over-exaggerated, and the bimetallic junction must not be assumed to condemn aluminum soldering without first giving the actual combination serious consideration.

Methods for soldering aluminum-base alloys are similar to those for other metals with the marked exception that dipping is not yet satisfactorily developed, at least insofar as dipping in molten solder is concerned. The oxide film difficulty accounts for this; it is found that friction, or friction plus flux, with the solder in intimate contact with the base metal, is necessary to produce a joint, or alternatively, a special temperature flux. It has been found practicable to use the latter as a dip bath, the surfaces to be joined being held together with the joining solder, and then immersed in the molten flux.

Brazing Alloy Flow

A systematic study of the flow of the brazing alloy in aluminum jointing has been made in Aluminum Research Laboratories, New Kensington, Pa., by M. A. Miller, results of which were presented to the Aluminum Welding Society, Philadelphia, in October, 1941. The following includes a résumé of the work carried out.

The practical work determined the extent of flow of, and the form taken by, liquid brazing alloys in various

capillary conditions, the capillaries consisting of aluminum tubes or arrangements of aluminum plates in parallel or at an angle to one another. From these data, calculations of surface and interfacial tensions were made for the liquid alloy in contact with solid aluminum. Thence, design data have been accumulated.

It was realized that it is impossible to wet the aluminum or aluminum-alloy surface properly with a brazing alloy unless the oxide film is completely removed, and that this cannot be reduced at temperatures as low as those involved, but removed only by means of an efficient flux. This flux has to serve several functions: (a) The complete removal of oxide film, as well as other incidental impurities, from both the base metal and the brazing alloy; (b) the provision of a protective blanket coating to prevent further oxidation during brazing; and (c) the modification of surface and interfacial tensions of the brazing alloy in order to promote its free-flowing characteristics.

To achieve these aims successfully, the flux must be molten a little below the brazing temperature; it must be sufficiently mobile to enter the jointing interstices ahead of the molten brazing alloy; it must be capable of dissolving aluminum oxide without adversely affecting its own physical characteristics and without having unduly adverse influences upon the alloy, as of corrosive attack, pitting and the like, and it must be stable under these application conditions.

Aluminum Soldering Fluxes

The fluxes used fundamentally comprise mixtures of halides of the alkali and alkaline earth metals. One formation is a mixture of equal parts of potassium chloride, lithium chloride, sodium fluoride and beryllium fluoride, while another comprises one part of cryolite, three parts of calcium chloride and six parts of potassium chlor-

ide. Zinc chloride as the base, with additions of sodium and ammonium chlorides and potassium fluoride, or with chlorides of potassium and lithium and sodium fluoride, or again with chlorides of ammonium and stannous tin, affords another series.

The fluxes are produced as uniformly mixed fine powders. For furnace brazing they are applied as pastes in water or in industrial methylated spirit, whereas in dip brazing they provide the liquid bath. The importance of stability, as well as of

homogeneous fluid is obviously important in the last case.

Soldering with Brazing Alloy

The position of the brazing alloy was also given consideration. In both furnace and dip brazing, conditions are similar, and may differ fundamentally from torch brazing or iron soldering. In these latter, the jointing alloy can to a large degree be forced to where it is required. In the two first methods, the brazing alloy has to be preplaced, and positioning must

be designed in order that it flow to where it is required, and not haphazardly. Surface tensional forces, or capillary, alone fundamentally determine where the braze will flow and the form it will take, although these forces may be accelerated by gravity, suction or pressure. For furnace and dip-brazing methods, the brazing or filler material may be present on the raw material. That is, filter-coated sheet, coated on one or both sides, may be employed, in which case design of component must take care of design for joining from the outset, and the filler material will be already present in the mating surfaces. Alternatively, it will be applied in the form of a wire, washer or strip in much the same way as is usual with copper for furnace brazing steel. In these cases, application will be during or after assembly of the parts that have to be brazed, and the volume of filler material needs to be fairly accurately calculated and its position correct in relation to the junction. These factors must, if necessary, be predetermined by trial.

Physical condition of the basis metal surface is also important, as is known by bitter experience to all those concerned with dip tinning of mass assemblies of metal terminals using a soft solder and resin flux. Telephone switch banks which may use terminals of brass, bronze or nickel silver are an outstanding example. With lightly burnished terminals, as by rumbling with steel balls and leather mousings, difficulty is encountered in wetting the brass with the solder, flow is not ready, and there is a strong tendency for the solder to "ball-up." The same principles apply to aluminum and its alloys. Surfaces roughened by light abrasive blasting, satinized by caustic soda/nitric acid treatment, or etched by acid immersion, favor wetting by, and spreading of, the molten filler alloy due to the capillary effect contributed by all the pores and cavities in the metal surface. Smooth and polished surfaces are unfavorable on account of the adverse surface tensional qualities.

Brazing requires close control of time and temperature because the jointing alloy is closely similar in composition to the base material itself, and the difference in solidus melting temperature is small. Close similarity of alloys means that if temperature is too high, and/or time is excessive, the tendency to alloy in preference to brazing as the main function increases, and proper flow may not be secured, but pitting and damage to surfaces may result to some degree.

TABLE I
Electrode Potentials in Volts in Artificial Sea Water at 77 deg. F. against Normal Calomel Cell. Values for Various Basis Metals and Alloying Elements of Solders to Illustrate Possible Corrodibility of Dissimilar Junctions.

BASIS METAL		JOINTING MATERIAL		
Metal	Potential	Type	Ingredients	Potential
Pure iron	0.46	Soft solder	Tin Lead	0.50
Mild steel	0.59			0.40
Medium carbon steel	0.42			0.60
Silver steel, 1.1% carbon	0.50			
Copper	0.25	Silver solder	Silver Copper Zinc Tin	0.02
Brass	0.26			0.25
Phosphor bronze	0.22			1.05
High tensile brass	0.26			0.40
Aluminum bronze	0.26			
Nickel	0.24	Brass	Copper Zinc	0.26
Monel metal	0.24			0.25
Cupro-nickel (70-30)	0.22	Copper		1.05
Nickel silver	0.24			0.25
LIGHT ALLOYS		LIGHT ALLOY SOLDERS		
Aluminum	0.80	Soft solder (tin-zinc alloy)	Tin Zinc	0.40
Aluminum-silicon alloy	0.80			1.05
Aluminum-magnesium alloy	0.82	Soft solder (tin-zinc-cadmium alloys)	Tin Zinc Cadmium	0.40
Duralumin	0.62			1.05
		Hard solders (aluminum with one or more of the following:—silicon, copper, zinc)	Aluminum Silicon Copper Zinc	0.60 to 0.82
				0.80
				0.25
				1.05

TABLE II
Miller's Values of Apparent Surface and Interfacial Tensions of Brazing Alloys in Aluminum Tubes

Type of Tube	Aluminum Alloy	Brazing Alloy	Brazing Flux	Radius of Tube In. (r)	Height of Rise In. (h)	Distance Between Plates In. (c)	Width In. (w)	Surface Tension Dynes Per Sq. Cm.	Interfacial Tension Dynes Per Sq. Cm.
Vertical round	3 S	X 716	No. 33	0.128	0.669	.....	.....	680	...
				0.059	1.457	.....	.....	685	...
				0.030	2.953	.....	.....	695	...
Vertical round	3 S	X 716	No. 51	0.156	1.550	.....	.....	...	250
				0.156	1.600	.....	.....	...	260
				0.125	1.960	.....	.....	...	250
Vertical abutting plates spread at 25 deg.*	61 S	X 716	No. 33	.....	0.394	0.217	0.500	680	...
				.....	0.787	0.110	0.250	690	...
				.....	1.181	0.073	0.170	685	...
				.....	1.575	0.055	0.125	690	...
Vertical abutting plates spread at 30 deg.*	2 S	X 719	No. 33	.....	0.300	0.267	0.540	645	...
				.....	1.203	0.071	0.135	680	...
				.....	2.000	0.039	0.080	635	...
Abutting plates spread at 25 deg.* Inclined at 45 deg.	61 S	X 716	No. 33	.....	0.591	0.140	0.330	660	...
				.....	0.984	0.087	0.200	680	...
				.....	1.378	0.059	0.140	650	...

* Correction not made for angle of spread.

All these factors were taken care of in the experiments that Miller made for determining surface tensions. The practical procedure adopted is as follows: The capillary shape to be tested was fluxed by brushing the flux paste or by dipping in molten flux. It was suspended in a furnace controlled to the correct temperature. In the same furnace and, therefore, at the same temperature, was a small reservoir of molten brazing alloy, free from oxide by virtue of a thin flux coating. When the temperature readjusted itself to constancy, the capillary shape was lowered so that its end just touched the flat surface of the molten brazing alloy. Instantaneously, the brazing alloy flowed into the capillary to reach the height and to take a shape characteristic of the size and form of the capillary and the surface tension of the alloy. The mass was then quickly solidified by means of a cold-air blast directed onto the outside of the capillary shape and onto the reservoir of alloy. The assembly was then cooled and washed free from flux, and sectioned. Sectioning was vertical for a round tube or for two parallel plates, and measurements could be made of capillary width and height of flow. For abutting plates, sectioning was horizontal. These sections are shown diagrammatically in Fig. 1. For measurements of height of rise and radius of tube, or width and distance apart of plates, and from density values of the materials examined in the liquid state, surface tension values were calculated.

Tension Values

Miller's values for surface tension of X.716 brazing alloy when molten, density 2.53 gm. per c.c., flow temperature 582 deg. C., are approximately 690 dynes per sq. cm. Values of similar order were obtained between abutting plates, whether vertical or at an angle, and whether the aluminum alloy was 2S, 3S or 61S.

In flux-dip brazing, interfacial tension between the liquid flux and the brazing alloy is of moment as well as the individual surface tensions. Miller's approximate value for the surface tension value of No. 51 flux determined at 1080 deg. F. where its density is 2.2 gm. per c.c. is 185 dynes per sq. cm. By simulating the conditions of flux-dip brazing in his experiments, he found the interfacial tension of X.716 brazing alloy against No. 51 flux to be about 250 dynes per sq. cm.

The flux and brazing alloy code numbers refer to proprietary prod-

ucts of the Aluminum Co. of America, many of which are patented.

Miller's results of these very difficult experiments showed close consistency and are reproduced in Table II. They were calculated by substituting the form measurements from the sectioned test pieces in appropriate formulas for round and flat plate capillaries respectively.

It should be borne in mind that these results apply specifically only to the solid and liquid phases taking

time may be kept nearer to the minimum required.

In dip brazing of light alloys, pre-cleaning, assembly, and after-washing can be the same as for furnace brazing. The work should be clean, and although solvent degreasing suffices to remove oil and loose dirt, it has already been mentioned that a roughened surface is to be preferred, as it helps capillary effects to come into full play. Consequently, a soda satin treatment or an aqueous alkali-

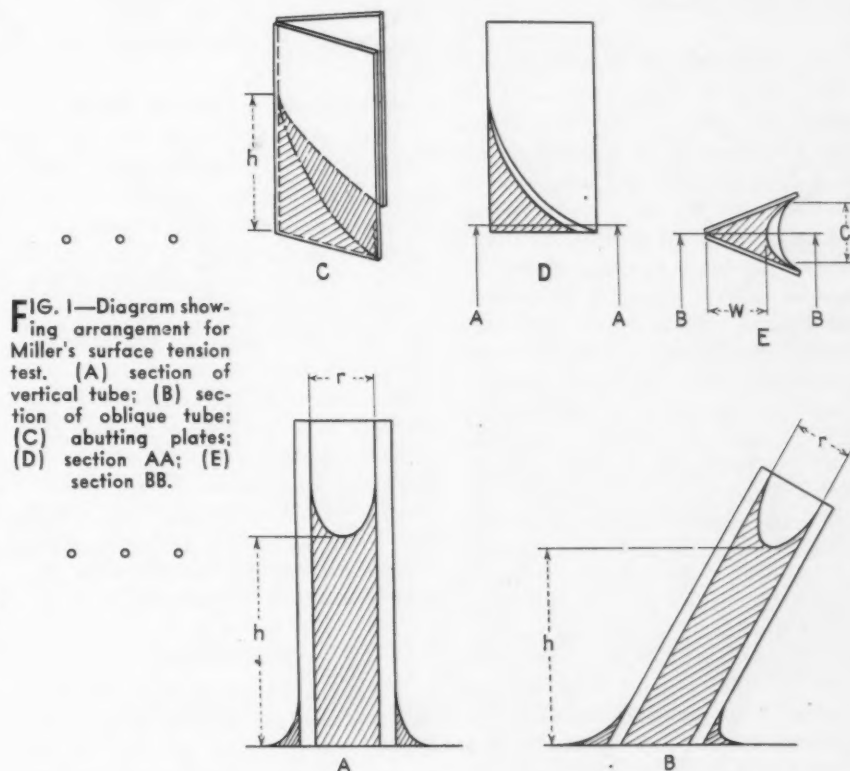


FIG. 1—Diagram showing arrangement for Miller's surface tension test. (A) section of vertical tube; (B) section of oblique tube; (C) abutting plates; (D) section AA; (E) section BB.

part in the experiments; it would seem unwise to base too wide generalizations upon them.

The distance of flow values given can prove a useful guide in design and production planning for predicting extent of spread of the brazing alloy.

With the aluminum alloys, mutual solubility of base metal and brazing alloy is high because of their closely similar composition and melting temperatures. In furnace brazing, there is a tendency for the filler material to dissolve sufficient base metal for it to freeze itself, promoting irregular penetration, entrapped flux and porosity. Practice indicates that clearances as much as 0.025 in. are necessary to overcome these troubles in laps of 0.25 in. or greater. For shorter laps or line contacts, considerably smaller clearances are satisfactory, and the same applies to dip brazing in which conditions are different, and

line clean is beneficial. The brazing alloy coated sheet material, of course, need not receive this etching treatment. The assembly of the parts to be brazed needs to be accurate, with proper spacing and quantity of brazing alloy in position. This quantity, predetermined by trial or from experience, must be correctly positioned, in the form of strip or foil or as a washer, between the junction, or as a wire firmly and snugly placed for feeding into the junction. The assembly must be held rigidly, and, as with furnace brazing, not only of aluminum alloys but of all the other metals, this is best achieved by making it self-supporting rather than by the utilization of jigs and fixtures. This can be done by tacking the component pieces together by spot welding, by means of rivets or by staking, and in some cases by bolting. When clamps or other jigs and fixtures are

used, the difference in their thermal expansion and that of the aluminum alloy must be carefully considered, and the brazing of the jigs to the work, of course, avoided. Stainless steel and graphite fixtures are commonest, although steel is used.

Regarding the furnace for the molten brazing flux, the most economic type is the modern electrically heated salt-bath furnace with internal electrodes. This ensures no overheating of the flux, a uniform temperature and the possibility of controlling temperature with exactitude.

Technique of Dipping

The work may be completely immersed or, whenever the junction conveniently permits it, partially submerged. The time of immersion is only that for the area to be brazed to heat through to temperature, and excess of time must be avoided because of local alloying. It is evident that dipping time is a function of the mass of the assembly; the capacity of the dip bath must be adequate to prevent undue loss in temperature upon immersion. Temperatures are within the range 1040 to 1185 deg. F.

Flux must be removed from the work immediately after brazing, and washing technique is similar to that for removing flux after autogenous welding. Although fluxes are readily soluble in water, and are even hygroscopic, the fact that the flux residue is in the form of a hard cake renders its complete removal an intricate job involving lengthy washing. Boiling in hot water for a prolonged period, from 10 to 30 min., assisted preferably brushing with a stiff brush, according to the nature of the part, is necessary. A final rinse in clean, flowing water and drying off is often sufficient. However, most workers insure the complete removal of halides that may have combined with the aluminum itself, by an alkali dip. In this, the work is immersion treated for a period up to one min. in 5 to 10 per cent caustic soda solution at 140 to 158 deg. F., then thoroughly washed

TABLE IV
Soft Solders for Aluminum-Cadmium-Zinc Series

Composition, Per Cent	No. 1	No. 2	No. 3	No. 4
Cadmium.....	70.5	41.0	25.3	65.0
Zinc.....	29.5	59.0	74.7	30.5
Aluminum.....				4.5
	100.0	100.0	100.0	100.0

in water, given an immersion in cold nitric acid (equal parts acid and water) for one to two minutes, and a final thorough water wash.

Dangers of Ineffectual Washing

This problem of flux removal cannot be too strongly stressed. Autogenous welding has the same problem and has solved it satisfactorily. One example from many in the field of hard soldering can be cited to demonstrate that it has been satisfactorily tackled. This concerns the fixing of spouts to kettles and teapots. Aluminum silicon alloy containing 10 to 13 per cent of silicon is the hard solder. Halide flux is used, in conjunction with a gas torch. Service shows that the junction withstands hot water and steam for many years. The same can be secured with furnace brazing and with dip brazing.

Dip-Soldering

With the hard solders, and with flux-dip methods offering such advantages, dip-soldering in the molten brazing alloy has little attraction. The high temperature involved promotes oxidation of the molten metal too easily. The close proximity of melting point of the brazing alloy and base metal renders it doubtful if the brazing alloy could be operated at sufficiently high temperature to yield thin coatings without excessive drag-out of brazing alloy, and blobbing or roughness of surface. With the soft solders, the situation is different, but new problems arise. These will be examined. Much work is in hand to solve these objections, but today no general commercial dip-soldering in molten alloy has yet been established.

One method exploited was based upon metal spraying a layer of another metal and then using ordinary soft-soldering techniques. The aluminum alloy was sand or shot blast, aluminum metal sprayed and copper metal sprayed. Such a technique is obviously expensive, cumbersome and complex, of very limited application.

A method more used was to nickel-plate by an established sound process and then to apply ordinary soldering practice. This is a more attractive proposition, but still has limited application to cases where plating complete surfaces is not objectionable, but is expensive where the plating is not required and only a local area needs "tinning." However, when small articles such as terminal tags, cable lugs and sleeves, require "tinning" so that in assembly shops they can be fitted and soldered with normal resin-cored solder, or with soft solder using non-corrosive resin fluxes, that is, in operations where water washing cannot be applied, treatment along these lines is not so illogical. Moreover, the orthodox nickel-plating procedure can in all probability be replaced by a series of operations long used successfully for brass, etc.

The complete process involves the following operations carried out successively without permitting tarnishing or drying off between them: (a) Thoroughly degrease. (b) Bright acid dip for non-ferrous, acid pickle for ferrous metals. (c) Nickel plate to a thickness of 0.00005 to 0.00015 in. (d) Tin plate to a thickness of 0.0002 to 0.0004 in. The work is then heat treated in a controlled-atmosphere furnace at 390 deg. F. for 30 to 60 min. The heat treatment diffuses the tin into the nickel coating, giving a continuous non-porous coating, that keeps virtually indefinitely without loss in soldering properties. This is a quality not fulfilled by straight electro-tin coatings.

This process has not been applied to aluminum or its alloys, so far as the writer is aware, but with sound nickel plating, that is, preceded by proper pre-treatment such as metal dip or sodium zincate dip, it should be successful. Further simplifications suggest themselves. For example, if a nickel metal dip be used for preparing the aluminum surface, this can be controlled by time and concentration to a thin, uniform, adherent coating

TABLE III
Soft Solders for Aluminum-Tin-Zinc Series

Composition, Per Cent	No. 1	No. 2	No. 3
Tin.....	79.2	81.4	69.4
Zinc.....	20.8	18.1	30.0
Lead.....	Traces	Nil	Nil
Antimony.....	Traces	0.1	0.2
Copper.....	Traces	0.4	0.4
	100.0	100.0	100.0

TABLE V
Soft Solders for Aluminum-Tin-Cadmium-Zinc Series

Composition, Per Cent	No. 1	No. 2	No. 3
Tin.....	56.0	45.6	40.0
Cadmium.....	9.7	18.5	20.0
Zinc.....	33.9	27.3	26.0
Copper.....	0.4	0.2	Traces
Lead.....	Nil	8.4	Nil
Aluminum.....	Nil	Nil	14.0
	100.0	100.0	100.0

that can be directly tin-plated and then heat treated.

The chief practical difficulty in soldering on aluminum-alloy surfaces having these preparatory platings is the tendency for the plating to blister and blacken.

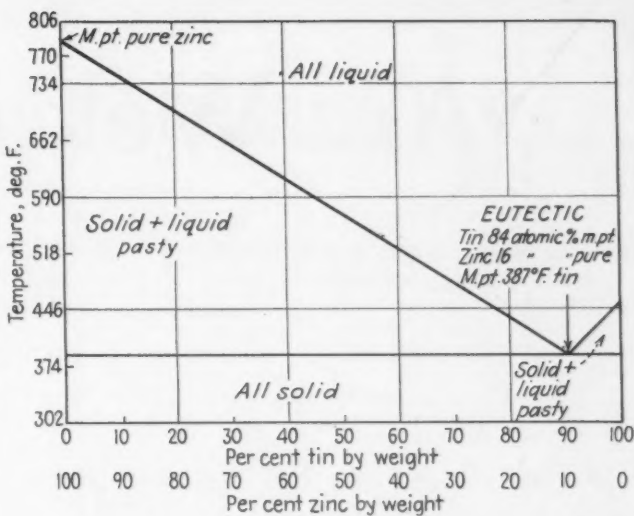
However, these electroplating procedures are mentioned to suggest a further simplified procedure. If the electroplater's nickel dip be properly balanced for the purpose, the tag-ends of components, normally cleaned free from grease, can be dipped in the nickel dip and then directly in the tinning pot containing one of the aluminum soft solders (tin-zinc or cadmium-zinc alloys), shaken or wiped in the usual manner, and thoroughly water washed.

Soldering Electrical Apparatus

Quite a number of workers are endeavoring to solve a real problem which, perhaps, affects the light electrical industries more than any others. Particularly in communications equipment, in which metallic continuity of contact is essential, is the use of aluminum restricted for this reason alone. The points mentioned above are given with a view to assisting in this direction. The dip solders used can with advantage be cadmium-zinc or tin-zinc alloys, with or without modifying additions of aluminum. Cadmium-zinc alloys are preferred from the electrolytic contact viewpoint, although the tin-zinc alloys are not seriously out in this respect. The cadmium-zinc series are eutectiferous with an eutectic point of 518 deg. F. corresponding to 82.3 per cent cadmium, 17.7 per cent zinc. Similarly, the tin-zinc series have a eutectic point at 387 deg., corresponding to 90.5 per cent tin, 9.5 per cent zinc. Simple representations of the equilibrium diagrams are given in Fig. 2 for the tin-zinc series and in Fig. 3 for the cadmium-zinc series. From these it can be seen that sharp melting points or the desired "pasty ranges" can be selected to suit individual purposes.

Table III gives analyses of typical aluminum soft solders of the tin-zinc

FIG. 2 — Simplified equilibrium diagram for the tin-zinc system. Representative soft solders for aluminum bases on these compositions will be found in Table III. This group is, from the standpoint of elimination of electrolytic corrosion dangers, somewhat inferior to the cadmium-zinc group.



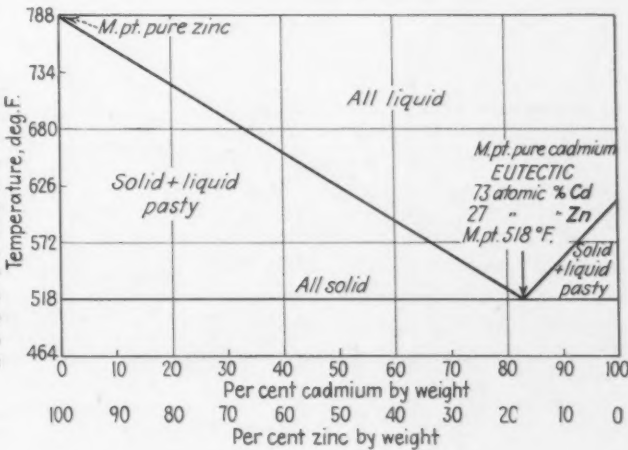
group. The lower melting high tin content alloys are more popularly used, particularly the 80 tin 20 zinc alloy. Table IV similarly gives examples of the cadmium-zinc series, including one solder having an aluminum addition. The 70 cadmium 30 zinc is most extensively used.

Table V refers to the ternary eutectic alloys of tin/cadmium/zinc, one having a lead and one an aluminum addition. It has already been stated that from the electrochemical aspect, cadmium-zinc is preferable to tin-zinc; from the practical angle tin-zinc is preferred because of lower viscosity just above the melting point. In fact, tin-zinc alloys are advocated at least in initial developments, until some line of progress is established,

when modified alloys having addition agents for specific purposes can be better studied.

In the foregoing account, non-ferrous and ferrous soldering practices have been discussed to illustrate that problems in the aluminum series are not really so divergent as at first may appear. Brazing of aluminum, with special reference to dip methods, has been given special attention in order to emphasize the progress made, the advantage taken of available brazing alloys in various forms and of modern furnaces, and the fact that the flux removal problem is being confidently faced instead of avoided. With respect to dip soft soldering, no information on established commercial practices can be given because the art has not yet reached that stage.

FIG. 3—Simplified equilibrium diagram of the cadmium-zinc system. General resemblance between this alloy system and the zinc-tin system should be noted. The cadmium-zinc solders for aluminum alloys are preferable, from the corrosion standpoint, to those based on zinc with tin.



58—THE IRON AGE, May 27, 1943

Cost Figured Graphically...

TWO exceptionally comprehensive discussions have recently appeared in THE IRON AGE^{1,2} on the pertinent subject of arc welding speeds and disposition rates. The practical application of the principles developed implies a training and experience not ordinarily possessed by operators, supervisors, checkers and timekeepers who must apply them to conditions encountered in actual production. The purpose of this article is to reduce them to terms that can readily be understood and utilized by such persons without resort to mathematical formulæ. The medium employed is the accompanying simple alinement chart consisting of seven equidistant parallel lines graduated logarithmically and designated as scales A to G, inclusive.

Scale A corresponds to the typical melting rate of the electrode at 100 per cent arc time. Plotted as gage points opposite the three classes, usually employed for d.c. welding, commercial sizes occupy positions having the values supplied by Chas. H. Jennings,¹ which are here expressed in pounds, rather than ounces, per hour.

Scale B is graduated in pounds and superimposed on it are the weights of 100 plug welds of selected diameters at various thicknesses and 100 lineal feet of fillet welds having the nominal leg dimensions indicated. Since a 1-in. square steel bar weighs 3.4 lb. per lineal foot, any special size and shape of weld may be added at the point corresponding to 340 times its sectional area in square inches. Conversely, the average sectional area of any continuous bead may be found by multiplying its weight per 100 lineal feet by 294 (the reciprocal of 340) and pointing off five places. The latter provides a convenient method of checking actual weld size from a tally of the quantity of electrodes used. Allowance for the bulge or convexity and deviation from nominal size of fillet welds may be made mentally and a correspondingly larger value selected to compensate for these variables. This aspect of the problem is very fully covered by H. O. Westendarp, Jr., in his discussion² which may be regarded as a sequel to the selection of the electrode.

It may not be amiss to reiterate that "an operator can make neither

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o o o

100 per cent theoretical fillet size nor 20 per cent oversize continuously" and add an observation in this connection. He is an exceptional operator who possesses sufficient skill to maintain the fillet size within 1/16 in.

¹"How to Select Arc Welding Electrodes," by Charles H. Jennings, THE IRON AGE, Oct. 15, 1942.

²"How to Figure Arc Welding Speed," by H. O. Westendarp, Jr., THE IRON AGE, Sept. 24, 1942.

Since the nominal size specified is, in effect, the minimum, this is equivalent to allowing a tolerance of minus 0, plus 1/16 in. While 1/16 in. is only 25 per cent in case of a 1/4 in. fillet, the weight of metal deposited in those circumstances would be increased 56 per cent. This relationship is graphically illustrated by scale B and must be considered in establishing time allowances and estimating costs.

Scale C is the production rate or welding speed at 100 per cent arc time and is the number of plugs or lineal feet of weld, as the case may be, of a specified size that would be produced in an hour if the arc were maintained continuously.

From the properties of logarithms, on which alinement charts are based,

Data as Worked Out in the Alinement Chart

Line Selected Data or Answer

- A 1/4 in. AWS E-6012 electrode selected (Above); 8.41 lb. per hr. deposition rate (Below)
- B 5/16 in. fillet selected (Above); 16.7 lb. per 100 ft. of deposited metal (Below)
- C 50.3 ft. of weld per hr. read off scale
- D 90c. per hr. wage scale selected
- E Reading omitted
- G 45 per cent duty cycle estimated from conditions
- F \$3.90 direct labor cost per 100 ft. read off scale, corresponding to 45 per cent duty cycle (Above). \$5.50 labor and overhead cost per 100 ft. at 40 per cent overhead (Below).

RECHECK for DUTY CYCLE

- A Actual deposition rate = 8.41 x 0.45 = 3.78 lb. per hr.
- C Actual welding speed = 50.3 x 0.45 = 22.6 ft. per hr.

a straight line through the selected electrode and size of plug or weld intersects scale C at the corresponding speed. In other words,

$$\frac{A}{B} = C$$

A second straight line through the point on C, so established, and the prevailing wage rate of the operator on scale D intersects E at a point corresponding with the direct labor cost at 100 per cent arc time; that is,

$$\frac{D}{C} = E$$

Graduation from \$1 at the right index to \$10 at the left index of scale E is omitted for the obvious reason that a 100 per cent duty cycle would be impracticable under any circumstances. As has been pointed out by Mr. Westendarp,² this factor "is subject to a large number of variables" and should be studied and established for various classes of work with due regard to the conditions under which it will be performed.

Duty cycle is defined as the ratio of arc time to overall time and is represented as a percentage of the latter on scale G but the graduations occupy positions corresponding to the coefficient Y. At 50 per cent duty cycle, only half as much production would result as if G = 100 per cent, and the unit cost would be increased X per cent, where

$$X = \frac{10,000}{G} - 100.$$

The unit cost for any value of G is Y times the unit cost for G = 100 per cent, where

$$Y = \frac{X}{100} + 1$$

Connecting the point on E previously established, with any value on G (plotted as the corresponding value of Y) by a straight line has the effect of multiplying the unit cost E (at 100 per cent arc time) by the coefficient Y, the product of which is at the intersection with F as shown above the line.

It is customary in most shops to apply overhead as a percentage of direct labor cost. Consequently, an auxiliary scale (below the line) can be employed to multiply values representing direct labor cost (above the line) by a constant. At an overhead rate of 40 per cent, as illustrated, this constant would be 1.4; at (CONTINUED ON PAGE 125)

Induction Brazing of Carbide Tips

COMMERCIAL availability of electronic induction equipment for routine brazing of carbide tools using any suitable brazing medium, including copper, is announced by Carboloy Co., Inc., Detroit. While based on standardized units, recommendations as to size of unit or units, basic coil designs, etc., will be supplied by the Carboloy engineering department on the basis of the individual user's needs. Arrangements have been concluded whereby the national service organizations of both Carboloy and the General Electric Co. will cooperate in assisting manufacturers using the equipment.

Among the numerous advantages of induction brazing of carbide tools over other methods are:

1. Greater convenience. Brazing technique is much simpler than when either furnace or torch brazing is used.
2. Greater speed. Heating is confined to the actual area desired. Time required to braze a tool is cut from minutes to seconds.
3. Greater simplicity. Unskilled labor can be used to braze carbide tools with induction equipment.
4. Accurate and automatic control. The amount of heat and its distribution can be controlled in electronic induction brazing as by no other method. Prevents incomplete brazes or cracking of tips due to localized overheating.
5. Lower operating cost. One hundred average tools can be brazed for less than 10c. total power cost. There are no furnaces to preheat.
6. Less brazing flux is required in induction brazing than in other methods.
7. Cleaner brazes. No scale formation. Neutral atmosphere not required even for copper brazing except when silicon-manganese steel shanks are used.

8. Less maintenance. There are no moving parts subject to wear or maintenance.

9. Greater safety. While considerable power is passed through the heating coils, the nature of these high frequency currents is such that there is no danger involved.

10. More consistent brazes. For a given size of tool the same dial settings with the same coils will always produce exactly the same amount and distribution of heat, insuring consistency of brazing results.

The Carboloy induction tool-brazing equipment is based on a new line of General Electric high frequency (500,000 cycle) electron tube oscillators, available in two sizes (5 and 15 kw. output ratings). The selection of the correct unit for any given installation is dependent on the sizes and quantities of tools to be brazed by individual users. The 15-kw. unit is designed to accommodate larger sizes of tools as well as multiple brazing of smaller tools, two or more at a time. The smaller 5-kw. unit is designed primarily for smaller sizes of tools.

The G.-E. electronic oscillators provide a high degree of sustained accuracy of heat control. They are particularly suited to brazing carbide tools as rapid surface heating is obtained due to the higher frequencies used. In addition to the oscillator, the only equipment actually required to braze tools by the electron tube induction method is a table carrying a tool holding fixture or fixtures, and



FIG. 1—Operator shown seating the tip with a steel rod after it and the shank have been brought up to the brazing temperature in the induction coil (left foreground) of the new Carboloy-G.E. electronic equipment. Tool is supported on a heavy block which is slid along a rail against an adjustable stop.

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the necessary water-cooled coil or coils to be connected to the terminals of the oscillator.

The coils may be formed in a few minutes from copper tubing when special brazing requirements arise. Where large numbers of tools are to be brazed and the unit has sufficient capacity, it is possible to use several coils in series, so that two or more tools can be brazed at a time. As shown in the accompanying sketch, the coils may take a variety of forms: cylindrical, box shaped, conical, single and double "pancake," etc., depending on the type of tool to be brazed and the distribution of heat desired.

Experience has shown that it is not necessary to puddle a tip while it is being heated. It is usually only necessary to seat it with a rod after the current is off and the tool has been removed from the coil, as shown in the photograph.

During the heating cycle, the steel shank first heats up faster than the tip due to its higher magnetic properties. Just before the correct brazing temperature is reached, however, it will be found that the carbide tip has reached a somewhat higher temperature than the shank. This is a desirable feature for maximum brazing effectiveness.

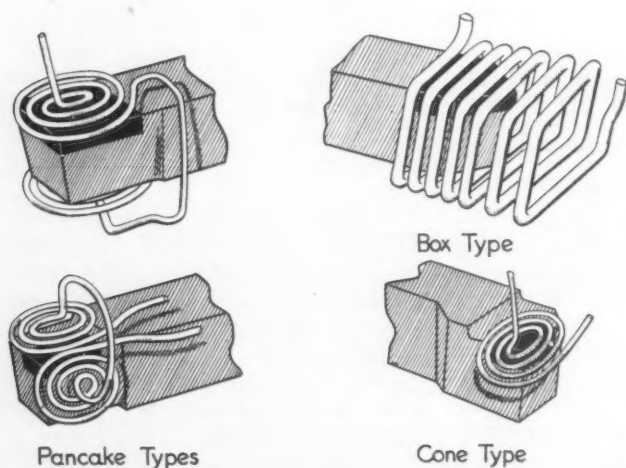


FIG. 2 — Sketches of typical coils, illustrating the variety of different designs which may be applied to the electron-tube induction brazing of carbide tools.

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RUSSELL C. BALL

Will head the activities of the American Gear Manufacturers Association for the coming year.

o o o

MUCH committee activity that will bear fruit in the next few months featured the 27th annual meeting of the American Gear Manufacturers Association, held at Rye, N. Y., May 17 to 19. With a rapid growth in membership in the past year, the attendance at the meeting exceeded all previous records. While only one new standard practice was approved at this meeting, a big step forward in the correlation of all previously adopted standards was taken and a great deal of time and effort went into working out new standards which will be brought before the membership for approval by the time of the fall meeting. Enough has been accomplished to date to make the standards of the A.G.M.A. a veritable textbook for gear design and to make the association the prime source on gear engineering data.

A.G.M.A. Standards

During the past six months, a concerted effort has been made to adopt a uniform method of procedure with regard to A.G.M.A. standards. One of the actions taken at this meeting was to change all previous "Recommended Practices" to "A.G.M.A. Standards or Standard Specifications."

A code number has been assigned each standard, and this number will be preserved throughout the life of that standard. On the cover sheet the date of original adoption and the

date of the last revision will be printed so that there will be no question as to what is the prevailing standard. On the back of each published standard, there will be listed all the standard specifications now in force and the related standards that apply to a specific specification. For example on the A.G.M.A. standard for concentric and parallel shaft gear motors, cross reference to standard specifications for tooth proportions, bearings, gear materials, shafting, durability of various types of gears, etc., will be listed for convenience in tying all these various standards together. Within the body of the specifications, these same cross reference numbers will also be listed in each specific instance where they apply. In the past complete cross-indexes of recommended practices have not been generally available.

A great deal of the activity at the 27th annual meeting was in reference to standard practices, many of which are not yet ready for final adoption and publication. The only formal action taken by the association as a whole, other than that mentioned above, was to draft an A.G.M.A. standard practice for the rating of planetary type speed reducers. This represents the third revision of a standard originally adopted in 1938.

New Officers Elected

Russell C. Ball, president, Philadelphia Gear Works, was elected president of the A.G.M.A. to succeed John H. Flagg, president, Watson-Flagg Machine Co., Inc. Mr. Ball has been active in association work for a number of years and served in the capacity of vice-president during the past year. He has been chairman of numerous committees and has been a guiding influence in the shaping of

A.G.M.A. standards. Mr. Ball has been connected with the Philadelphia Gear Works for his entire business career, which started prior to World War I.

Louis R. Botsai, manager, Gearing Division, Nuttall Works, Westinghouse Electric & Mfg. Co., Pittsburgh, was advanced from treasurer to vice-president of the association. He has served as chairman of various committees, including finance and gear motor. Mr. Botsai has been connected with Westinghouse since he graduated from Auburn College and has served in the company's engineering and sales department prior to his appointment last year as manager of the gearing division. He is succeeded as treasurer of the A.G.M.A. by Paul W. Christensen, president, Cincinnati Gear Co.

At the annual meeting four members of the executive committee were elected: R. G. Davis, manager, Industrial Gear Div., Foote Bros. Gear & Machine Corp., Chicago; W. H. Kinkead, manager, Gearing Div., Link-Belt Co., Philadelphia; H. H. Kerr, president and treasurer, Boston Gear Works, Inc., North Quincy, Mass.; and R. B. Tripp, vice-president, Ohio Forge & Machine Corp., Cleveland.

Edward P. Connell Award

The Edward P. Connell Award, established last year in memory of the late Mr. Connell of the Falk Corp., was given this year to Aubrey A. Ross, who retired last winter as chief engineer of the Marine Gear Div., General Electric Co., Lynn, Mass., after completing 48 years of service. Mr. Ross served his company in numerous capacities and was an important factor in the development of marine propulsion gearing drives.

He has been an active member of the A.G.M.A. almost from its inception in 1917, and has served in numerous capacities, including the presidency of the association in 1935-6. The presentation of the award was made by Edward W. Miller, general manager of the Fellows Gear Shaper Co. and a past president of the association.

WPB Control

The opening general session of the annual meeting began with a talk by R. C. Sollenberger, deputy chief, Material Handling Equipment Branch of the WPB, who discussed various limitation orders as they apply to the gear industry. The speaker indicated that Order L-193, which applies to conveyor equipment and power transmission machinery, amended on May 15, limits acceptance of orders to priority ratings of AA-5 or higher on all gearing and speed reducers.

Referring to the Controlled Materials Plan, Mr. Sollenberger indicated that all industrial gears came under Classification No. 153 in the B list. Aircraft gears, ship propulsion gears and other gears built directly into war products are on the A list and are getting a blanket AA-1 rating for all materials entering into these drives. He urged that all manufacturers fill out CMP forms for third-quarter requirements immediately in order that materials for gears on the B list are properly provided for. He also urged that more care be used in filling out such forms, indicating that the chief cause of delay in processing these forms in Washington was lack of information needed to allocate materials in line with the urgency rating of various end products. He also asked that in the case of cancellation due to cutbacks in war contracts, the manufacturers return the unused material allotments to the WPB so that these materials could be released for other uses. Otherwise, these materials remain frozen in steel mill schedules.

Much of the discussion centered around General Scheduling Order M-293, relating to critical common components, which includes gearing applicable to a variety of war products. In this connection Form PD-843 has been sent to gear manufacturers on which they are required to record their available capacity for producing various types of gears. The capacity is reported from month to month in dollar volume of output.

It was evident from comment from the floor that manufacturers are putting different interpretations on these



LOUIS R. BOTSAI

Moved up to vice-president of the A.G.M.A. after four years as treasurer.

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data and that therefore the statistics being compiled by WPB are likely to be misleading. Mr. Sollenberger indicated that the dollar volume should show capacity to produce spur gears, for example, in a given month on the basis of all possible equipment being available for that work. The same form would also show a similar capacity for production of helical and herringbone gears, even though the same manufacturing equipment would be used in both instances. The net result is to show a fictitious overall capacity in dollar volume, inasmuch as facilities cannot be used 100 per cent on all products at the same time.

On the other hand, one large manufacturer indicated that in filling out his form, he allocated his capacity as to various types of gears and gear reducers on the basis of the percentage breakdown of product as governed by shipments in the preceding quarter. Others urged that capacity be represented in available machine hours rather than dollar volume.

Mr. Sollenberger and the group of experts who accompanied him from Washington left the meeting more or less in a state of confusion and with a feeling that the statistical information being obtained from the industry would be somewhat misleading because of the various interpretations used by manufacturers in filling out Form PD-843.

Aircraft Gear Procurement

Major John D. Tebbin, Army Air Corps, Wright Field, discussed prob-

lems in the procurement of aircraft gears. Space is provided on PD-843 for reporting shipments, orders and capacity to produce four types of aircraft gears, and Major Tebbin urged that manufacturers bring such capacity to light because of the tremendous increase in demand for such gears, particularly airframe actuating gears.

On the same program, Capt. B. P. Ward, Bureau of Ships, Navy Dept., reviewed design trends in marine propulsion gears as used by the Navy. One of the problems had been to double the horsepower available for drive in the same space. Marine gears line speeds up to 18,000 ft. per min. and loads up to 1500 lb. per inch of gear face, and higher.

Captain Ward indicated that important combat types of vessels will use a type of reduction gear identical with the Mahon class of destroyers developed some years ago. This drive employs a high pressure cruising turbine which idles when the combined high pressure and low pressure main turbines are used to drive a ship at maximum speed. He gave design data and tooth loading on such propulsion gears for various types of combat vessels. The general trend has been to increase the tooth load per inch of space and the pitch line speed.

Collectivism vs. Capitalism

The post-war America we do not want is a socialist or Communistic political economy which the "collectivists" would like to force upon us, according to Dr. Ruth Alexander, radio commentator and lecturer, who was the principal speaker at the annual banquet of the association. Deriding planned economy as dangerous fairy tales, Dr. Alexander warned that the very fact that manufacturers as a group think they must have an overall post-war plan was playing into the hand of the collectivists. The reason we don't want a planned economy, she said, is that it means a concentration of government power. A single big mistake in government policy may ruin the nation, whereas the individual mistakes of manufacturers are limited in scope.

Many persons seek security, but in doing so sacrifice freedom. Other men court insecurity, as only the self-reliant can be politically free, Dr. Alexander commented. The moment you give the State the power to do something for us, you give the State the power to do something to us, she

concluded. In dealing with the collectivists, we must reckon with security-minded people who lack the economical self-reliance which is typical of the successful business man who is willing to take risks in order to secure a profit for himself. The speaker defended the profit motive and the capitalistic system in general.

Whereas mass planning was derided by the dinner speaker, at a later session Tell Berna, general manager of the National Machine Tool Builders Association, pointed out that in looking to the post war world there was a desperate need for an element of common sense in future planning as applied in industry. Considerable imagination will be required in meeting the acid test of the application of general principles in the shop.

Tracing the growth of machine tool production since 1938, Mr. Berna indicated that according to recent pronouncements of the WPB Facilities Review Committee, order boards of the builders were due for a drastic cutting back in some instances. With a threat of cancellation of the whole or part of the \$600 million backlog of the industry, plants are beginning to work on conversion right now. Mr. Berna stressed, however, that the machine tool builders must be in a position to take care of sudden changes in requirements in machine tools at all times.

Tool Builder Worries

Some of the other problems facing the industry today, mentioned by Mr. Berna are: Loss of men to the draft (constant turnover of personnel is an extremely serious problem); materials substitutions complex government regulations and renegotiation. The last named problem hangs over the industry like a dark cloud. Because the cycle of ups and downs in machine tool buying has always been sharp, in good times the industry should be permitted to lay aside reserves to carry over the next low spot, but the International Revenue Department says "No!" On the whole, however, the machine tool builders have from the start cooperated with Washington and have worked in harmony with government men, despite the fact that government regulations are becoming increasingly complex.

In a humorous vein Mr. Berna recounted the metamorphosis of a business man who goes to Washington to help out the war program on the production front and his gradual disillusionment.



JOHN H. FLAGG
Retiring president of the A.G.M.A.

sionment. The speaker's indictment of the statisticians and lawyers that infest WPB and the endless conferences, with all government departments represented, caused many a chuckle from the audience.

Induction Hardened Gears

A great deal of interest was shown in a paper presented by Frank J. Curtis, chief engineer, Van Norman Machine Tool Co., on the high-frequency induction hardening of gears. Mr. Curtis indicated that while SAE 1045 had good qualifications for surface hardening up to 60 Rockwell C by induction hardening, his company has had considerable success with X 1340 steel, which is a resulfurized steel of excellent free-machining qualities. He foresaw the opportunity to get away from high alloy gear steels in use today.

Induction hardening will also result in some changes in the processing of gears. Teeth can be shaved before hardening, for example, and not touched after this heat treatment. Cleaning costs can be entirely eliminated as compared with carburizing and bushings and inserts can be machined in place prior to hardening since the heat does not penetrate into the core of the gear but rather tends to follow the contour of the teeth. Similarly hole grinding can be done prior to hardening rather than after.

Mr. Curtis illustrated a number of examples of induction heating applied to cluster gears of different diameters in which each gear element is hard-

ened separately. When hardening gears by high frequency heat (300,000 cycles per sec.) very little distortion takes place on the average gear unless the rim and web sections are very thin. The speaker indicated that tests show that in solid type gears there will be practically no dimensional change, although there may be a slight increase in size at the pitch diameter, but the concentricity will remain unchanged. This increase in pitch diameter can be allowed for when the teeth are machined.

Bevel gears may be hardened by high frequency using much the same procedure as used for spur gears. With spiral bevel gears, however, the eddy currents are disturbed to the extent that there is a tendency to obtain more heat on one side of the tooth than on the other. On some sizes of spiral bevel gears, this tendency can be overcome by supplying slightly more heat to insure hardening of the concave side. On other forms of spiral bevels, however, Mr. Curtis recommended carburizing the teeth after rough cutting, then following with final cutting, after which the teeth can be induction hardened by allowing sufficient time to heat the entire tooth. Obviously when the gear is quenched in the fixture, only the carburized surface will become hardened.

Fatigue Failures Analyzed

In a comprehensive paper reviewing all the methods whereby the fatigue strength of machine parts can be improved, John O. Almen, research engineer, General Motors Research Laboratories, stated categorically that fatigue failures result only from tension stresses and never from compressive stresses. He also stated with equal emphasis that any surface, no matter how smoothly finished, is a stress raiser, including even a flat surface.

While most fatigue failures are attributed to metallurgical reasons, it has been Mr. Almen's experience that fully 90 per cent of such failures are traceable to design and production difficulties. It has long been appreciated that vulnerability to fatigue increases as the surface roughness is increased, particularly if the roughness consists of sharp notches, and more particularly if the notches are oriented at right angles to the principal stresses. The surface of repeatedly stressed specimens, even when finely finished, is much more vulnerable to fatigue than the under layer. This surface vulnerability may be due to sub-microscopic notch defects or to

the fact that the surface is a discontinuity since the outer crystals are not supported on their outer faces.

According to Mr. Almen, the fatigue strength of the most carefully prepared specimen will be increased if a thin layer of the specimen is pre-stressed in compression by a peening operation such as peen hammering, swaging, shot blasting or tumbling, or by the pressure of balls or rollers. He illustrated charts which showed that large increases in fatigue durability resulted in shot blasting of typical machine parts, whether those parts were hard, such as carburized gears, or soft, such as steering gear parts.

Effect of Shot Blasting

According to Mr. Almen, the most plausible explanation of the effect of this surface compressive stress is that when a load is applied to such specimens, tension stress in the surface layer is less by the amount of compression pre-stress, and since fatigue failure starts from tension stress, fatigue durability of the weak surface layer is increased. By the same token, however, the tension stress in the materials below the pre-stressed layer may actually be increased, although the fatigue strength of the part as a whole is not lessened, since the lower layer is inherently stronger than the surface layer.

Further evidence of the extreme vulnerability of the surface layer is found in the behavior of specimens like thinly carburized, cyanided or nitrided specimens. Fatigue tests show greater strength than the same material in the unclad state. A nitrided specimen is probably superior to other forms of hard cladding, because in addition to the higher physical properties obtained, this layer is in a state of compression.

The speaker warned that pre-stressing of the surface layer may be overdone so that the strength of the machine parts are actually decreased by too intense surface peening. In actual practice where parts are peened by shot blasting, a thin test piece is subjected to the shot blast and its curvature, produced by the compressive layer, is measured with a special gage.

Mr. Almen also indicated that efforts to improve products by improving surface finish may sometimes have the opposite effect. On ground surfaces, heat from the grinding operation may sometimes create high tension stresses that from the standpoint of fatigue strength may do more harm than good. Similarly in polishing operations, sufficient heat is often de-



NEWBOLD C. GOIN

Continues as executive secretary of the association.

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veloped to induce serious tension stresses and thus promote instead of prevent fatigue failures.

The speaker reminded his audience that fatigue data are mortality data and it is just as absurd to expect actuarial tables could be constructed from mortality data on half a dozen individuals as to expect that reliable comparisons can be made on fatigue tests on half a dozen machine parts.

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AUBREY A. ROSS

Recipient of the Edward P. Connell Award.

He illustrated charts to show that the live dispersion of Mazda lamps and ball bearings compared very closely to the life expectancy of human beings.

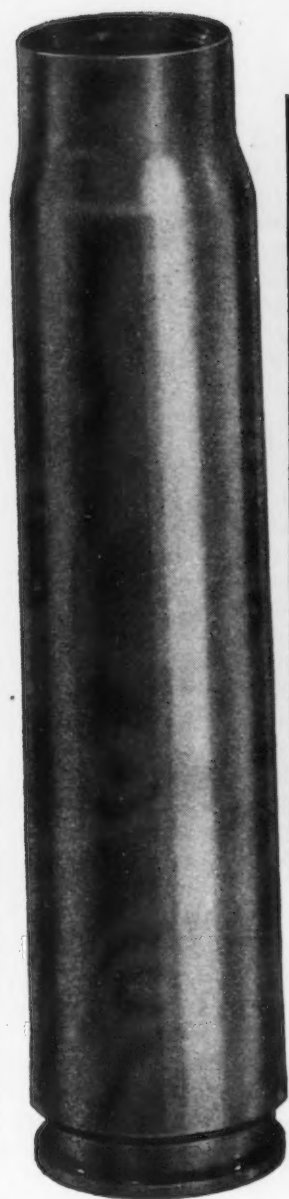
In a large number of samples, about one-tenth the number of items tested will have lives about one-quarter the average, and some samples will last two or three times the average life. Mr. Almen concluded by saying that reliable life comparisons of machine parts demands a great number of tests unless the difference is very great. Otherwise on the basis of a few tests, poor design of material may rate higher than the superior design of material. Much test data that are reported are erroneous due to the small number of tests made.

Ride-Sharing Plan

A simplified method of classifying employees so as to facilitate ride sharing to the job was explained by Granger Devenport, assistant chief engineer, Gould & Eberhardt, Inc. Instead of classifying the residences of employees into rectangular zones, at G & E a map has been worked out classifying employees by eight points of the compass. In this way the zones are pie-shaped and increase in width as the distance from the plant increases. This is a decided advantage over uniform rectangular zones, because two employees in the same zone 20 miles away from the plant, for instance, should be doubling up and using their cars even though each might have to go 5 miles out of his way to pick up the other.

Two small cards are utilized to keep records of each employee's transportation status. One card, filed alphabetically, simply has the man's clock number, his name, and his department number. The other has complete information on the employee, including his name, shift and zone classification, distance from plant, department number and complete transportation data. To make the system complete, a bulletin board lists each employee according to shift and under nine columns, representing those living within walking distance and those within the eight compass point zones. Under each compass point zone the employees are grouped by distance from the plant in even miles.

When an employee wishes to find riders or drivers living near him, he simply has to look for his name on the bulletin board under his shift and under the proper directional column. Since the clocking and department numbers are listed along with names, it is a simple matter for an employee to form his own car sharing group.

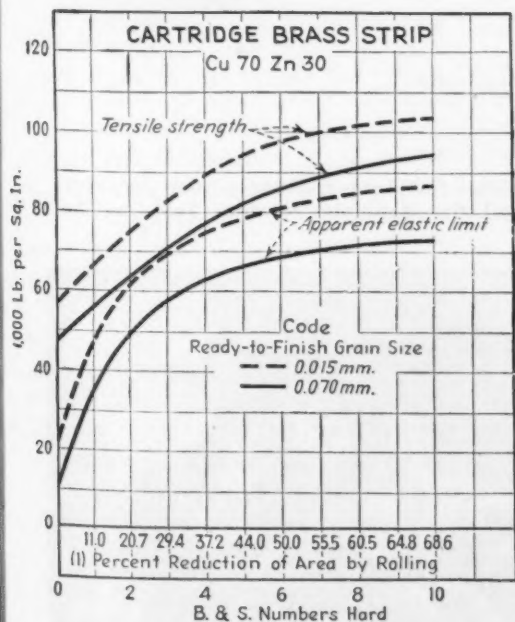


It pays to know the "personality" of CARTRIDGE BRASS

Most users of cartridge brass know that it has the most favorable combination of ductility and strength of all the brasses, that it can be readily spun, drawn, forged and upset. But many have discovered that even a metal so obliging can have a distinct "personality" of its own which has a bearing on methods of fabrication.

For example, its mechanical properties are markedly influenced by the ready-to-finish grain size — the crystal size obtained by the anneal before the final cold working operation. The chart shown here helps to illustrate the extent of this influence, and the effect of cold working, on the tensile strength and apparent elastic limit of cartridge brass strip, for the smallest and largest grain sizes commonly met in commercial annealing.

This is but a single example of the kind of information with which Revere is prepared to supply users of metals. It is one reason why persistent fabricating problems seldom trouble Revere customers. For copper-base alloys and practical help in using them, get in touch with Revere today.



As shown by this chart, control of the ready-to-finish grain size is necessary if uniform physical properties are required in the finished metal.

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STANLEY H. BRAMS

• Production of 7500 civilian trucks is authorized by WPB . . . The jeep gets into an FTC battle . . . 27,000 workers stop at Chrysler in biggest war walkout.



DETROIT—Officials of 13 truck companies began the cycle of preparation this week for the output of 7350 heavy duty trucks for civilian use, manufacture of which was authorized by the Automotive Division of WPB.

A total of 5750 4 x 2 units has been allotted among manufacturers as follows: Autocar, 700; Corbett, 50; Federal, 450; General Motors Truck, 1040; International Harvester, 2000; Mack, 650; Reo, 210 and White, 650.

The 6 x 4 allotments are as follows: Federal, 220; International Harvester, 780; Kenworth, 100; Peterbilt, 100; Reo, 150; Sterling, 150. Four-Wheel Drive and Walter were allotted 65 and 35 trucks respectively of 4 x 4 classification.

It was expected that 150 added units would be authorized in the near future to bring the total to an even 7500.

Immediately following the authorization for these units, allotments for materials began to arrive at the companies from ODT, which acts as claimant agency in this program. Figuring that it requires three months or more to obtain alloy steel, the truck makers expected it would be mid-August or thereabouts before actual production got under way—the cycle of truck manufacturing normally requires about four months from planning to final assembly stage.

Some inventory is on hand to aid these manufacturers, however, particularly in light sheet which was left

over when civilian output was halted a little more than a year ago. It is expected that the assembly work can be sandwiched in between the military trucks now being produced without any impairment of the latter's production.

The trucks will be distributed to dealers and will then go into the government pool, from which deliveries to purchasers are permissible on presentation of certificates of necessity issued by ODT. For the most part, the vehicles to be completed will be used for long distance hauling, logging and mining operations. Inasmuch as this output will give the dealers some new vehicle business to work on, the companies are rather glad to see the authorizations come out, even though manufacturing schedules are already well filled at most plants.

In addition to this program, the ODT has listed as necessary for transportation equipment for this year 9200 trailers, 2100 third axles, 3000 city-type integral buses, 7400 bus bodies, 75 trolley buses and 3000 sedan conversions. Details on these civilian requirements have not yet been completed. The manufacture of these items is expected to meet minimum domestic transportation requirements, including both maintenance and new equipment.

THE ubiquitous little jeep rides over smooth roads or rough meadows, crosses shallow streams or (outfitted in a steel hull) swims lakes, climbs mountains, and fights viciously. It is in the news today for two rea-

sons—a Federal Trade Commission's complaint and Henry J. Kaiser's development work.

The FTC complaint against Willys-Overland Motors, Inc., reads that the Toledo manufacturer has represented in ads and news items that it created and developed the vehicle. The complaint goes on to credit the idea of creating a jeep to the American Bantam Car Co., of Butler, Pa., in collaboration with Army officers.

The history of the birth of the jeep is as obscure today as it was three years ago, when the army realized that such a job was needed and outlined the general requirements to automobile companies, among them American Bantam.

American Bantam telephoned engineer Karl K. Probst at Detroit. Probst had been in touch with Bantam on the subject earlier, but the plans which had been discussed were entirely general. The news which Bantam gave Probst over the phone was that a design and specifications had to be in Washington the following Monday—five days away.

Probst started off from Detroit on what must have been one of the most intensive missions ever undertaken by an engineer. He stopped in Toledo and contacted potential supplier companies; their developing engineers helped to sketch out designs and make up specifications. This procedure was repeated in Cleveland. Probst got to Butler two days later with the groundwork of his project laid.

In company with Bantam engineers, he worked three days and

TEACHER'S AID: A giant micrometer facilitates training of new employees for the production line of the Lodge & Shipley Machine Tool Co., Cincinnati.





A Tool Room "Mystery": Can You Solve It?



The case: trouble in the tool room of a booming war production plant. Pratt & Whitney Jig Borers, perfect when they left our shipping room, had performed with all their usual amazing accuracy throughout the summer. But as fall came on, the operators began to complain of trouble with the end measures. Jobs were going haywire by as much as .002" . . . unheard-of in a P&W Jig Borer.

Clues: The P&W service engineer called in on the job was able to eliminate several common external causes of jig borer trouble. Many expanded plants these days are using warehouses or other old buildings where floor support is unsteady. Not so here. Others have placed the machines in direct sunlight, so that expansion and contraction ruined the set-up. Not so here. These new machines were positioned at a north wall, at windows where direct sunlight never entered. The operators worked in the comfortable warmth of steam radiators, far from the chilling draft at the windows. End measures were carefully stored

within reach in their boxes over the radiators. *Problem:* spot the "Gremlin" behind this plant's sudden trouble.

Take 10 seconds to think it over

Answer: That's right! How could you miss? No sunlight, but thermal expansion and contraction still at work in two ways. Those cold drafts from the windows on one side of the machines and hot radiators on the other. Okay all summer, but when they turned on the heat — bang! Second, those end measures — stored above the radiators at some 30° above room temperature — contracted when they went into their channels on the machines, and so produced a shifting setting. Our service engineer pointed out these facts . . . assisted

in redesigning the room so that the jig borers were on the inside wall and the benches on the opposite side. After that there was no further trouble.

* * *

Pratt & Whitney's skilled machine tool service engineers can help you spot and cure troubles in your shop layout. This one was pretty obvious, but chances are you have occasional headaches whose solutions don't leap to the eye. When you do, call on Pratt & Whitney. We don't just make good machine tools and let it go at that — we follow through to see that you get full value out of them. That's another way we can make good on our offer of *basic accuracy for mass production*.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
West Hartford, Connecticut

PRATT & WHITNEY
MACHINE TOOLS * SMALL TOOLS * GAGES

Basic Accuracy for Mass Production

nearly three full nights developing detailed specifications for the vehicle. To make a long story short (some other details are in *The Assembly Line* of Dec. 12, 1940) the entire folio of planning was completed late Sunday and moved immediately into Washington to meet the Monday morning deadline. Any engineer or designer will instantly appreciate the unprecedented difficulty of designing and specifying a vehicle practically from the ground up in five days.

The Probst job was the first quarter-ton rated scout reconnaissance car. Willys and Ford, among others, had submitted designs for similar vehicles, and they, too, were given contracts. Bantam's deliveries were notably smaller than those of the other two, for the simple reason that its facilities were not capable of turning out the volume of work.

The job went into the field labeled the "GP," and from this, the word "jeep" readily derived. Bantam gradually faded from the production picture and ultimately the unit was standardized for production between Ford and Willys, using a Willys engine. In the process of standardization, the vehicle gradually underwent transition and acquired weight of an amount considerably greater than was envisioned when the Army people first broached the idea to the manufacturers, considerably greater, too, than that of the original Bantam job. The Willys viewpoint has appeared to be that the transition was of such breadth that it deserves credit for the design as it now stands.

The leaves of the calendar have flipped over a great many times since those days, and now Probst is back in the jeep picture as the designing engineer for Kaiser. Once again, however, there are other manufacturers in similar development work, and they will probably put sample 1943 model jeeps before the Army for consideration along with the Probst-Kaiser creation. A limited time advantage may accrue to Kaiser and Probst, however.

MEANWHILE there is a bit of suspicion developing in Detroit that the Kaiser entry into the automotive field may well have Washington's tacit backing, if not positive encouragement. It is recalled now that Kaiser had a conference with President Roosevelt early in March, the one at which well-publicized pictures were taken showing the West Coast industrial tycoon presenting the



GAGING MADE SIMPLE: At inspection benches of a Nash-Kelvinator plant rows of boxes at the back of the bench provide for ready disposition and segregation of rejected parts. Handling and correction are made simple by grouping the rejects by type of fault in the boxes.

President with a model of a new type boat which he proposed to build. It was less than a week afterward that Kaiser came to Detroit and let the word get around that he was going to manufacture jeeps on an experimental contract which, he hoped, would be followed by a production contract. The nearly direct route which Kaiser took from the White House to Detroit is not lost on motordom.

Kaiser's entry into the war production vehicle picture is certainly cheerful from the Kaiser standpoint, if not downright delightful. He could hardly hope to manufacture boats in quantity for any long time after the war, and some of his other enterprises hinge just as tightly on the war. But production of a vehicle will wedge his foot in the automotive door, creates an opening into a field which will expand, not contract, after the hostilities end. It may well be that Kaiser was projecting his thinking a long way ahead when he first pondered the idea of building a jeep. At any rate, he started his planning capably, for when he laid his project out in Detroit, it was well engineered, and the development work since has followed the public conception of the Kaiser formula—getting things done quickly and thoroughly.

The automotive community is not doing a great deal of talking about the matter in public, although it is doing considerable thinking in pri-

vate. Its attitude on long-term Kaiser competition is well expressed in the remark of one leading executive a few days ago: "We'll like nothing better than to take on Mr. Kaiser when the war ends and free competition can prevail."

Last Thursday "unauthorized strikes" were finally and flatly revealed for what they actually have been when some 8000 employees of Chrysler Corp. began a walkout which extended to six plants and 27,000 men by weekend. In this greatest of all work tie-ups since Pearl Harbor, the planning was bare-faced and apparent, despite the characterization of the tie-ups as "spontaneous."

Leaders of Chrysler union locals said the walkouts were the result of long trains of unsettled grievances, and explained by charging that the corporation was taking advantage of labor's no-strike pledge to violate its promises and agreements on collective bargaining. The specific allegations made by the union were denied equally as specifically by the company.

Although the walkout was described as spontaneous, it was no secret that the strike action was in the wind. A half hour or so before work stopped, the company had wired union president R. J. Thomas in the east of action scheduled for 10:00 a.m. Loud speaker cars were at the scene and signs materialized out of nothing for the hands of picketers who marched before the gates an hour or so before they went home. Work ceased uniformly in one plant after another. One can well wonder how union leaders had the unmitigated gall to declare such carefully worked out action "spontaneous."

Little has been said out of Detroit in the past months about the continuing wave of slow-downs, walkouts and tie-ups, because they were short-lived, because they were seldom critically important and because they were commonplace. But there is no gainsaying the fact that tens of thousands of manhours of work have been lost in the Detroit area since the turn of the year. The momentum of the movement is increasing. As was said here earlier, the memory of Pearl Harbor is growing dim.

Or perhaps it is being purposely shaded by Axis agents. Or, if not by Axis agents, by irresponsible leaders whose pay would more fittingly come from Berlin than from appropriations made for the requirements of the American armed services.

Intricate shapes like these present fewer fabricating difficulties when Carpenter Stainless Strip is used. These aircraft moldings show some of the forming possibilities open to the designer who works with this versatile strip.



About the toughest heat resistance job a metal has to tackle is fighting the high temperatures and the corrosive action of aircraft exhaust gases. This exhaust collector ring made from Carpenter Stainless Strip, in the form of welded tubing, gives long trouble-free service on the job.



How Carpenter Stainless Steels are Helping to SPEED OUTPUT —and lick tough design problems



It's no trick at all to speed the production of smooth-working valve parts like these when you use Carpenter Free-Machining Stainless Steel. In service, this Carpenter Stainless eliminates trouble from galling and seizing of valve parts.



Fewer rejects of deep-drawn parts fabricated from Carpenter Stainless Strip is made possible by a constant check on the strip's uniformity during every step of manufacture. And no process annealing was necessary on these parts, thanks to the ductility of Carpenter Stainless Strip.



The Carpenter Steel Company, 121 Bern St., Reading, Pa.

When Carpenter invented Free-Machining Stainless, and pioneered in the development of ductile Stainless Strip, the way was paved for today's speedier output of perfect Stainless parts.

Take advantage of Carpenter's diversified experience with design and fabricating problems involving Stainless Steel. Your nearby Carpenter representative can assist you in the shop—and can keep you in close touch with our Metallurgical Department.

Here is a working "assistant" you should have on your desk. This 98-page book "Working Data for Carpenter Stainless Steels" contains practical engineering information to help you speed the production of Stainless parts. Use it to help you plan the use of Stainless Steel in the development of new products that will win sales battles tomorrow.

This Working Data book is available to users of Stainless Steel in the U. S. A. For your copy, drop us a note on your company letterhead.



Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

• Legislators are threatening to dissect WPB and pressure is being brought on the White House to coordinate the efforts of the "czars" and to stop destructive feuding . . . WPB trying to remedy defects and improve its morale.



WASHINGTON—It is about time for WPB to have another crisis. More than 90 days have elapsed since Ferdinand Eberstadt lost out in the elevation of Charles E. Wilson to the executive vice-chairmanship and history shows WPB has a shakedown every 90 days.

Congress is on the warpath again. The legislators threaten to dissect WPB and pressure is being brought to bear on the White House to coordinate the efforts of the various "czars" and to stop destructive feuding.

Administration forces in Congress may be able to defeat the Maloney-Scrugham Bill to divorce the Office of Civilian Supply from Donald Nelson's authority and the reason is that the tried device of reorganization to prevent Congressional intervention has already met the Congressional threat. But Congress will be back again and there are stirrings in this direction.

The White House trump is the dismissal of Mr. Nelson and Mr. Wilson as Leon Henderson was dismissed, if the going gets too tough. It should be pointed out though that this card will not be played until all other means have failed and Congress will not be mollified unless there is some neck chopping.

THIS would be regrettable because WPB's organizational pirouettes have not only sandbagged industry's morale, but have become

boring. The Nelson-Wilson combination, though the most successful so far, has nowhere near a perfect technique in steering around the Scylla and Charybdis of the Army and Navy demand. They have not been able to handle the "curmudgeons," intoxicated with vanity and self-importance. This may be explained by the Truman Committee's suggestion that the reason is Mr. Nelson's authority is on paper with respect to heads of departments—that every priority dispute has to be taken to the White House.

Mr. Nelson has not been very well understood, if this is the state of affairs. He has had to assume responsibility for things which he could not possibly control. Furthermore, he has obeyed the President's instruction almost to the letter on the question of public airing of his troubles with cabinet members and it is reported that he has had plenty of provocation.

On the other hand, it is questioned why he has put up with such an anomalous state of affairs—why he has been content to pretend to carry a bludgeon when it was only actually a twig. The answer to this may be in Mr. Nelson's personal loyalty to the President, and his desire to serve the country in the best way he can.

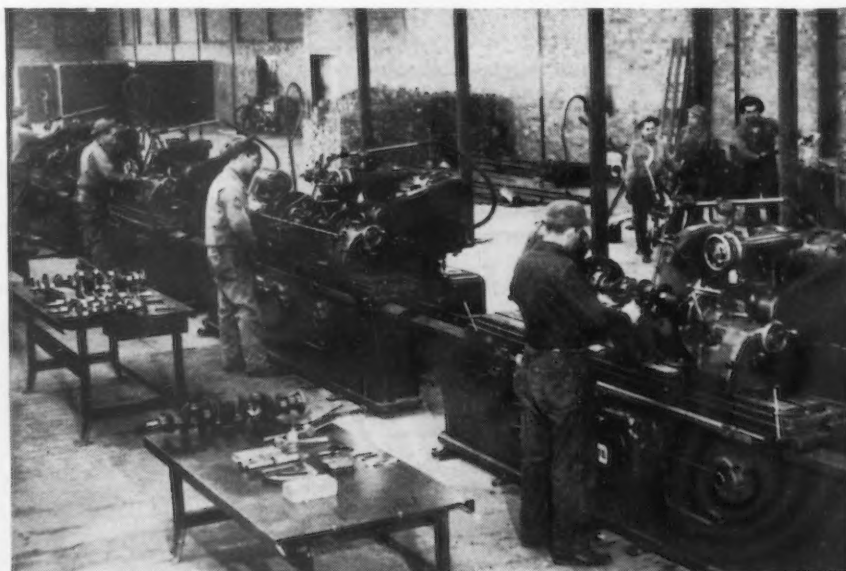
Counter to this, sources close to the administration deny that power

has been withheld. One of Washington's few statesmen says that the organization charts are all right, but that Mr. Nelson lacks the experience and qualifications for his high post. Others point out that Mr. Nelson has not starred as an organizer, that WPB morale has been notoriously low for months—that petty internal rows between division heads have not ceased since the last "realignment."

IT is true that WPB still is loosely knit, that it has thousands of excess employees—employees who find it more difficult each day to find work to do and are mere pensioners. Also, it is true that the small surface indications of efficient operation are still lacking. For instance, the industry divisions do not all have centralized filing and statistical set-ups. Moreover there is no uniformity in statistical methods or filing systems.

However, WPB is trying to remedy some of its defects. It is trying to improve its own morale. Services of hundreds of employees are being terminated and rather detailed delegations of authority are being given to major personnel. Mr. Nelson and Mr. Wilson have gone on morale missions through the industry divisions, seeking to pep employees up by more intimate contact with them. Mr. Nelson has asked all employees to

BRITISH IN-LINE METHODS: Closest thing in England to good old U. S. mass methods is this plant at a United States Army Base where soldier-mechanics rebuild motors and put them back into service.





TO HELP AMERICA

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Victory Steel

ON May 10th, production of Magnefer was begun at a new kiln plant, just completed under the direction of Basic Refractories, Inc., in behalf of Defense Plant Corporation. This new unit adjoins our burning plant at Maple Grove, Ohio. It supplements the Company's capacity for the man-

ufacture of Magnefer, Syndolag and other clinkered dolomite products.

Basic Refractories' customers now are assured of ample supplies of Magnefer and Syndolag needed in the industry's war program, which

calls for extra millions of tons of open hearth and electric steel.



BASIC REFRACTORIES, INCORPORATED
CLEVELAND, OHIO

PRODUCERS OF MAGNESITE AND DOLOMITE HEARTH MATERIALS FOR STEEL FURNACES

Heading Both Ways at Once on Questionnaires

Washington

••• The Army Quartermaster Corps has adopted a simplified one-page contract for purchases involving a total outlay of less than \$500,000. It will reduce paper for contract forms about 75 per cent.

The new form is similar in design to that used by mail order houses. On the front is a purchase agreement, ruled spaces for a number of items, unit and total prices and the signatures of contracting officers. On the back are laws and regulations governing sale of products to government agencies.

The purchasing officer simply sends the order to a manufacturer and if it is accepted the seller signs the agreement and the contract is made.

Pittsburgh

••• A "frankenstein" questionnaire has been created by a large government arsenal. Contractors are asked to answer 26 pages of questions on proposals which may involve as little as 100 tons of steel.

The questionnaire includes: a thorough study of factors involved for setting a delivery promise; number and price data on contracts held with Army, Navy and Maritime Commission; 22 items on estimated cost; 28 fiscal questions on cost of article under past contract; questions on labor and work hours; questions on taxes and methods of financing; 11 questions on escalator clauses; and questions on sub-contracts and additions to facilities.

wear a little WPB pin, with "pride and satisfaction."

All of these actions are favorable signs, but thousands instead of hundreds should be dismissed and detailed delegations of authority should be extended lower than the heads of divisions. Furthermore, it is contended that WPB should revise its internal paper work.

THE great secret of government newly discovered by industrialists in Washington for the duration

is that to have a government job one must devise paper work to keep busy. It is the over-doing and the ineffective doing of this which makes for so much of WPB's confusion.

On the other hand, some business men come to Washington with the idea that they are going to accomplish earth-shaking things, that they are going to cut through all red tape and become Messiahs. This desire, although in the main laudable, at least theoretically, is practically impossible and even ridiculous.

Some recover from their delusions of grandeur and are restored to normal thinking and acting. Others never do. Often the transmutation of a sane important industrialist to a bustling boondoggling bureaucrat is one of the marvels of Washington.

What the business man with a red-tape cutting complex usually cuts is demonstrated government procedure. Of course, this has unfortunate results. When the industrialist can't find any duties to perform, where he does not have anyone to tell him how to create paper work, he resigns in frustration. So it goes.

How to Get SWPC Help for Your Plant

••• Filing a brief form with the Smaller War Plants Corp. is the first step toward obtaining new and suitable contracts for your facilities if they can be described as "distressed." The form is WPB 2282 which is obtainable from your local WPB office. A representative of the WPB Smaller War Plants Division will assist you in surveying your plant and direct you in filing the forms.

To qualify under the term "distressed," SWPC says that your plant should be small in relation to your particular industry and in need of work; that present volume of business in hand should not exceed 66 2/3 per cent of your average volume from 1936 through 1941 or; that your present backlog of business will be completed within the next 30 to 60 days with no more business in sight.

If your plant has machine tools and equipment which might be used for a variety of purposes it might also be well to obtain form WPB-1546 for the recording of this information.

THE BULL OF THE WOODS

BY J. R. WILLIAMS



George Scribner Heads Plastics Industry Society

Chicago

••• George Scribner, president, Boonton Molding Co., Boonton, N. J., was elected president of the Society of the Plastics Industry at the annual conference held here recently. Other officers named include: chairman of the board, Ronald Kinnear, Niagara Insul-Bake Specialty Co.; vice-president, H. Bunn, Carbide & Carbon Chemical Co.; and secretary and treasurer, H. H. Wanders, Northern Industrial Chemical Co. Elmer E. Mills of the Elmer E. Mills Corp., Chicago, was general chairman of the meeting.



A 50-caliber bullet tears through the recoil mechanism of an anti-tank gun far out on a foreign desert. The gun is out of action—but not for long. Spare parts are rushed up from the supply base, and soon the gun is blasting away again.

But what if these new parts don't fit? What if they are a trifle too large or too small? The answer is all too obvious.

Interchangeability of parts for all kinds of war equipment can be assured only by the careful inspection of every critical dimension with reliable gaging instruments before these parts are shipped to our fighting forces.

SHEFFIELD is a Recognized Authority on Dimensional Control, producing the gages that assure the interchangeability of manufactured parts.



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DAYTON, OHIO, U.S.A.

Specialists in Dimensional Control












WEST COAST . . .

OSGOOD MURDOCK

• District OPA directors reportedly defy Washington on meat for loggers . . . Coast pig iron, scrap abundant . . . AFL, CIO hit Lewis by no-strike vote . . . Negotiations pending on increased wages for Coast shipyard workers.



SAN FRANCISCO—"We greatly regret that, pending clarification of national policy concerning increased rations of meats and fats for persons engaged in the logging industry, we cannot see our way clear to alter the stand we have taken."

Thus, according to credible reports, recently wrote two district OPA food rationing directors respectively having jurisdiction over two Far Western states in which logging is a major industry.

The remarkable thing about this asserted correspondence is not the OPAcity of the phraseology, which is characteristic, but the recipient of the letters. They were not addressed to some unfortunate lumber camp operator seeking to halt the tide of defections of underfed employees, but to Washington, D. C., headquarters.

The story runs that the respective state OPA food rationing chiefs, having a more intimate acquaintance with substantial giants of the forest than the cherry trees bordering the reflecting basins of the nation's capital, took matters into their own hands. When dietitians in Prentiss Brown's diet kitchens east of the Mississippi smugly stood by their rulings that horny-handed men of the mines and woods require no more victuals for minimum subsistence than the dieting stenographers of Manhattan, the Far Western directors in question approved increased rations for the hard-hit lumber camps. To support their stand they dusted off studies which

had been made by the U. S. Forest Service as to the amount of food needed to maintain health and morale in the logging camps. The survey, made long before food rationing was thought of, bore out the elementary axiom that efficiency in the woods is not measured in decimalic amounts of meat.

When this on-the-spot study by a reputable federal agency failed to knock the pencil pushers off their perch, and the Western officials were ordered to revoke the increased rations which they had authorized, the tidy refusal quoted at the top of the page was penned.

This tale—and it cannot be confirmed—seems entirely too good to be true, but, like the "V" for Victory, it will serve adequately as a badly needed banner of hope for the misunderstood industries of the backwoods.

SIGNS are more evident every day that the labor shortage of last summer which dried up mineral production will be duplicated this year. Possibly the situation will be more serious, for the leaks in the nonferrous metal mining and logging stabilization plan, coupled with the constant drain by selective service, have speeded the evaporation of this marginal, but highly important, labor force. Despite the furlough last fall by the Army of over 4000 soldiers, draft boards in states like Nevada, in which agriculture and mining are the sole occupations, have been faced with quotas which must be filled. Thus, while the Army fills the sock from the top with furloughed soldiers, selective service drains the labor supply by puncturing the toe.

A fortnight ago CIO and AFL lumber union officials accused the West Coast Lumbermen's Association of asking the Army to take over logging in the Pacific Northwest. The association denied the charge. In the last war soldier work brigades were moved into the spruce woods with disappointing and unfortunate results.

Shortage is not the story in the coast steel industry, however, where raw materials are abundant. Beating to the punch any possible critics, Columbia Steel Co. last week explained that a blast furnace which it had brought at Uncle Sam's request from Illinois for reerection at Provo, Utah, was ready for operation, as were rehabilitated beehive coke ovens in the same state. Production, Columbia ex-

plained, was awaiting only the government's word that it was needed.

Official word from WPB only confirmed the well-known fact that coast pig-iron and scrap stockpiles are overflowing, that Columbia now has 100,000 tons of pig-iron stored in Utah, that this stock will be increased to 300,000 tons, and that Kaiser is holding heavy stocks at Fontana. This horn of plenty will eventually feed steel-making facilities now long delayed in completion.

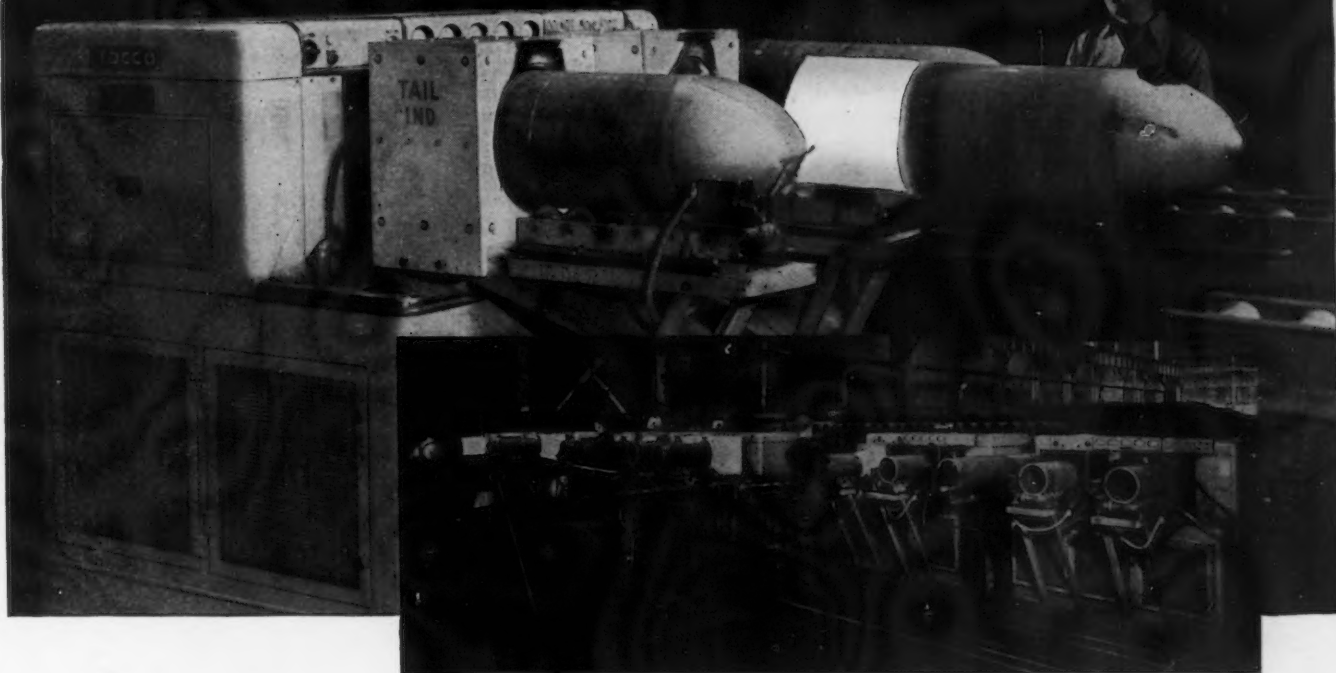
TWO major Pacific Coast labor groups, one CIO, the other AFL, have hastened to go on record as abhorring even the idea of a strike, with pointed emphasis toward John L. Lewis and the United Mine Workers.

At Los Angeles, delegates from 15 CIO United Auto Workers unions, claiming to represent 70,000 workers, most of them in aircraft, adopted resolutions reaffirming the national no-strike pledge, and pointing out that the Mine Workers' tactics "at this time serve only the enemies of the people and retard the achievement of the just demands of the miners and delay progress of organization and the winning of the war. The principal aircraft plants at which the UAW is bargaining agent are North American and Vultee.

The labor press saw in the resolution a direct slap at Walter Reuther, UAW executive board member and head of the Union's General Motors department, who, it was stated, "has been spreading confusion in the ranks of the nation's largest union in an attempt to change UAW policy over to the Lewis line of strikes and disrupting war production."

A more direct strike threat was defeated by a vote of more than two to one by delegates to the AFL Pacific Coast Metal Trades Council, representing 37 unions constituting bargaining agents at most of the coast's important shipyards. The Council was fidgety for fear the master agreement between its members and the shipbuilders would not be reopened as to wage provisions, an action called for by the terms of the agreement itself. A resolution was offered stating that unless a conference were called by June 6 for the adjustment of wages, "the Pacific Coast Metal Trades Council will not be responsible for action taken by its membership" and called on the mem-

THIS "BOMBARDIER" HITS THE TARGET **EVERY 49** SECONDS



At Wheeling Steel Corp., batteries of TOCCO machines are really putting the heat on the Axis—heating the ends of pipe to 2100° F. for the spinning of bombs.

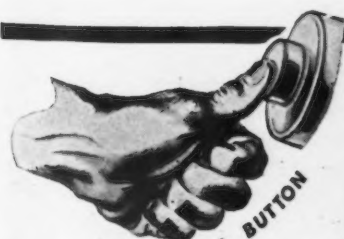
One operator, manning two TOCCO machines, each with two inductors, heats tail ends of these "500-pounders" and feeds one to the spinner every 49 seconds.

The heated area of every bomb is uniform. TOCCO's automatic timing assures accurate temperature for uniform forming results.

Yes, it's a fast pace, but the "bombardier" maintains it easily. The push of a button starts each TOCCO station. His "bomb bay" between the four stations of the 7' wide TOCCO machines is compact. His working conditions are safe and free of fire, heat and fumes.

Just as TOCCO is blasting the Axis in this and hundreds of other war factories, so will it crack wide open many of your tough problems in post-war planning. Find out how these dependable, rugged induction heat-treating machines will cut your costs and improve your products.

THE OHIO CRANKSHAFT COMPANY
Cleveland, Ohio



TOCCO

World's Fastest, Most Accurate Heat-Treating Process

**HARDENING
ANNEALING
BRAZING
HEATING for
forming and forging**

ber unions in the shipyards to take "direct action." Pushed by Anthony Ballerini, former president of the Council, the resolution was eventually defeated by a vote of 71 to 35.

THE Pacific Coast shipbuilding stabilization agreement, as originally agreed upon in April, 1941, was the first industry-wide plan stabilizing wages and working conditions, and covered the principal Pacific Coast yards, with the exception of Bethlehem at San Francisco. Much of the credit for its negotiation went to Paul R. Porter, government representative, who later succeeded in securing the adoption of similar agreements by the shipbuilding industry on the Gulf and East Coast.

The agreement provided that "on demand of labor at the end of the first year's operations under this agreement, and on demand of either party, every six months thereafter, the wage scales herein agreed to shall be reviewed by the parties. If the cost of living, as shown in the 'Index Numbers of Cost of Goods Purchased By Wage Earners and Salaried Workers in Large Cities,' published by the United States Bureau of Labor Statistics . . . shall have changed at the time of review from the cost of living at the time of the making of this agreement by 5 per cent or more,

the wage scales shall be correspondingly adjusted." The base wage set by the agreement for journeymen in most crafts was \$1.12 per hour.

By the time the agreement was one year old, in the spring of 1942, Porter had succeeded in gathering delegates from the Gulf and East Coast shipyard labor and owner groups at Chicago, for promulgation of a nation-wide shipbuilding stabilization agreement. The cost of living index meanwhile had risen 13 per cent. Because wage scales in the shipyards of the South and East had lagged behind those of the West Coast, and because the White House was finally coming around to the belief that any effective inflation control must include wages, extreme pressure was brought to bear on the Pacific Coast labor delegation to accept less than the 13 per cent wage raise called for by their agreement. A raise of approximately 7 per cent, about half the amount called for by the agreement, was finally agreed upon, making the average journeyman's wage \$1.20 per hour. It was agreed that the unions would encourage their members to invest the total raise in war bonds. As a matter of fact, because of overtime pay, the average hourly earning of workers covered by the agreement runs close to \$1.30 per hour.

Porter, now officially chairman of

the Shipbuilding Stabilization Committee, let it be known when he came to the coast a few days ago that chances of boosting the wage rate again as provided by the agreement were very slim by reason of Executive Order 9250 giving the War Labor Board sole responsibility for judging wage agreements and Executive Order 9328 restricting the WLB or any agency acting under its authority, such as the Shipbuilding Stabilization Committee, from increasing wages except under the Little Steel formula or in case of sub-standard wages.

DISAPPOINTMENT at the meeting of the Coast Metal Trades Council, which represents labor in the agreement, was strong, but, after rejecting the strike-action resolution, it was voted merely to send a delegation to Washington, D. C., to urge a meeting of labor, government and employer representatives on the West Coast to reopen the agreement. Delegates confirmed the almost universal union stand that prices must be rolled back if wages are to be frozen.

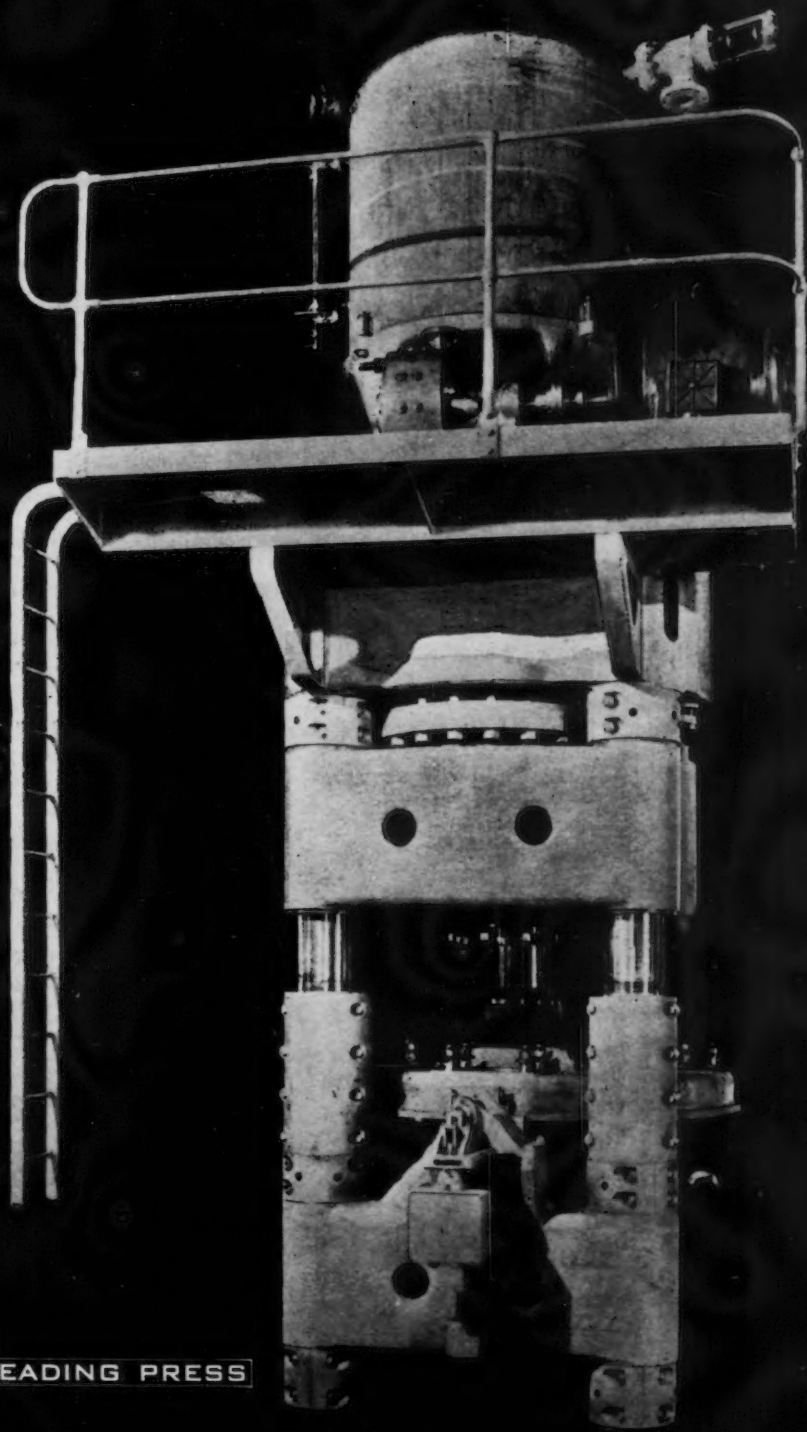
Shipyard management sentiment seems to be agreeable to considering the wage-cost of living clause in the same light as when it was originally written, inasmuch as most of the coast yards are working on a cost-plus incentive fee basis.

Other notable action of the meeting, at which employer and Federal representatives were in attendance as guests, was to vote, once and for all, opposition to two ten-hour shifts daily as compared to the present three eight-hour shifts. Some support has always been found for the two ten-hour shift basis by the management of yards on San Francisco Bay, led by Bethlehem, but labor support has never been won. From the labor standpoint, the fact that fewer hours per day would be paid for offsets any lure of overtime and disputed increased efficiency. In the Puget Sound area, both management and labor representatives rejected the ten-hour shift proposal. Reports have not yet come in from Los Angeles, but it now appears certain that the ten-hour shift will be shelved, probably permanently.

From the standpoint of other Pacific Coast industries, either an increased shipyard wage or a general ten-hour shift basis in the shipyards would mean trouble. Present high shipyard wages have proved an unbalancing factor, luring labor from agriculture and other West Coast industries unable to meet the scale.

PRODUCTION HOP: Maintenance department employees of General Electric's Pittsfield works enjoy noon-hour square dances to the music of Ernie Schmidt's "Gloom Busters," all of whom are members of the department.





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570 LEXINGTON AVENUE

NEW YORK

N. Y.

Fatigue Cracks

BY A. H. DIX

Bootleg Reading

• • • Carleton (New Departure) Beckwith, who asks for a new supply of the routing forms we furnish free for convenience in passing THE IRON AGE from reader to reader, wants this sentence added to his form:

Only through READING can we hope to keep informed as to what is going on in our own industry and, equally important, in other industries.

As our bread and oleo depend upon the popularity of the visual method of getting information, we say "Ear! 'Ear!" to Mr. Beckwith's sentiment. A cardinal point in our creed is that success and a yen for the printed word are affinities, like Damon and Runyon, by and large, and Scotch and soda. We are, therefore, mystified and dismayed whenever we run across an individual who has done pretty well for himself and who boasts that he reads practically nothing.

To keep our faith high, we have been in the habit of explaining away the success of these heretics by telling ourselves that either they do an uncomfortable amount of listening or else have developed a method of acquiring information by osmosis. But we are now beginning to believe that what we took for a phenomenon is frequently a mere affectation, for the other day we walked in on a veritable dean in the ranks of alleged non-readers, and there he was, up to his ears in your favorite family journal. He looked as embarrassed as if he had been caught reading *Fanny Hill*.

"I just dip into it every now and then," he apologized.

Dropped Fractions

Which reminds us to mention a talk we had the other day with a man who used to work for Thomas A. Edison. "Was it true," we asked, "that Edison got along on four hours sleep a night?" "It was true all right," he said, "but the old man never mentioned the catnaps he took in the daytime."

Non-Conformist

• • • As you know, the post office is dividing the 178 larger cities into postal districts. Our official address is now 100 East 42nd St., New York 17, N. Y. The "17" designates the Grand Central area, and if you think of it you might add it when addressing us.

We called up the post office to find how we are to go about getting the district numbers on the address stencils for subscribers in these cities. "Send us a list of your New York City subscribers and we'll mark it up for you," we were told. "Shall we mail it to General Post Office, New York 1, N. Y.?" we asked, to show how well-informed we are, having noticed from a map in the newspapers that the main post office has designated its own district as No. 1. "No, don't bother about that," we were told. "Just mark it 'New York.'"

English—In Natural Finish

• • • This is from B. L. Herman, of the business staff:

You might be interested in the following transcript of a test letter one of my customers dictated to an applicant for a position as stenographer:

Fair Banks Morris Co.,
Superior, Ohio.

Gentlemen:

Will you please arrange to forward this check promptly, in as much as it was drawn in the account of a man now deceased and must be forwarded to his execution.

Your very truly,
Vise President

The young lady gives the King's English quite a going over, and although we believe she has grounds for suit against her educators, the sense of what she writes is clear and that is probably all that is necessary in these days of approaching total war, which leaves no time for the luxury of pedantry.

In air raid warden language incendiary is in-cend-er-

ary. The extra "r" is probably permanent, as in *sub-sid-er-ary*. Aviation is now *avv-ee-ay-shun* to people why fly planes, people who build them, and even to officials of companies whose corporate titles include the word. But whether *avv* or *ay* the planes will fly just as high and as fast, and we can't see that it makes any difference one way or another.

Blurb

• • • Editing is like dropping stones in an abandoned well. You can never be sure that there will be a splash. With every one and his brother getting out some kind of a priority guide we couldn't be certain what kind of a reception would greet the eighth edition of ours, the one that was supplied as a separate section of the April 29 issue.

After it was out we held our breath for 48 hours, until the returns began to come in. The verdicts, we are happy to report, ranged from enthusiastic to ecstatic; the demand for extra copies has exhausted our supply, and again we marvel at the brains department's uncanny ability to divine what you, our loving readers, need—and, what is harder, supplying it.

Paper-Saving Signature

I am one of your loyal eight readers of "Fatigue Cracks," and have a contribution for your collection of signatures:



This is to Certify that Tall Cedar

Emil Otto Schott

IS STANDING UPRIGHT IN

JUNIATA VALLEY FOREST No. 88



SCRIBE

The scribe of our lodge is A. C. Hackenberger.

—Emil O. Schott, Baltimore

Mr. Hackenberger overcomes the difficulty of crowding a long name onto a small card by writing the separate syllables of his name one on top of the other. The result may be hamburger, but it is fittingly arcane.

(Aside to Mr. Schott—Not eight loyal readers—eighteen (18).)

Surprise

• • • Next week a brand new editorial feature will greet your eyes. It is one for which we predict great success, but in line with this page's policy of sticking its neck out no farther than necessary, we will wait until six months have passed before saying positively.

Aptronyms

Gerald C. Kopp is a lieutenant in the Louisville police department.

—A. L. Fawcett,
Louisville Industrial Foundation

J. M. (Acheson Colloids) Lupton calls attention to the fact that the assistant editor of *The Chementator* is R. Guess. Too bad, J. M. cracks, he isn't editor of a racing form.

Puzzles

Last week's numbers are 5 and 7.

This one is from E. N. (Napoleon Products Co.) Yeager, Napoleon, O.:

While dealing regularly in an ordinary bridge game, South dropped some of the undealt cards onto the floor, but retained the rest in his hand. He then observed that the number of cards on the floor was two-thirds of the number he had already dealt West, and the number already dealt to East was two-thirds of the number of undealt cards still in his hand. How many cards had been dealt?

"CLEAN SWEEP"

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WT	Chicago Telegram
LC	Chicago Cable
MT	Chicago Radio Letter
SL	Star Letter

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 FAIRBANKS MORSE AND CO.,
 BELOIT, WISCONSIN=

DIESEL ENGINES OF YOUR MANUFACTURE POWERED THE US SUBMARINE WAHOO IN HER RECENT SPECTACULAR VICTORIES OFF NORTHERN NEW GUINEA. THE WAHOO SANK A JAP DESTROYER AND TWO DAYS LATER SENT TO THE BOTTOM A FOUR-SHIP ENEMY CONVOY, CONSISTING OF TWO FREIGHTERS, A TRANSPORT LOADED WITH TROOPS AND A TANKER. FOR THIS MAGNIFICENT FEAT THE WAHOO TODAY WEARS A BROOM AT HER CONNING TOWER -- THE NAVY'S TRADITIONAL DECORATION DENOTING A "CLEAN SWEEP". YOU WHO FURNISHED HER FINE DIESELS SHARE IN THE HONOR. THE BUREAU OF SHIPS TAKES PLEASURE IN EXTENDING SINCERE THANKS FOR THIS SPLENDID EQUIPMENT. NAVAL CRAFT AWAIT YOUR ENGINES. KEEP THEM COMING=

E L COCHRAN, REAR ADMIRAL USN, CHIEF OF THE BUREAU OF SHIPS.
 1013A

We of Fairbanks-Morse appreciate Admiral Cochran's telegram giving Fairbanks-Morse Diesels a share in the honors won by the illustrious crew of the *Wahoo*. We are proud that our Diesels can serve with men so fearless—and pledge to keep Fairbanks-Morse Diesels coming for Navy craft. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.



FAIRBANKS-MORSE

DIESEL ENGINES
 PUMPS
 MOTORS
 GENERATORS
 SCALES

WATER SYSTEMS
 FARM EQUIPMENT
 STOKERS
 AIR CONDITIONERS
 RAILROAD EQUIPMENT



Diesels

Dear Editor:

MACHINERY COSTS

Sir:

In connection with certain tax evaluation work, it is necessary for us to determine the trend of machinery costs, and we would appreciate any information you may have available.

PAUL B. LEVENGOOD, Asst. Secy.

Basic Magnesium, Inc.,
P.O. Box 1150,
Las Vegas, Nevada

● Report No. 8 issued by the Securities and Exchange Commission, Philadelphia, may help. It is a survey on 42 general industrial and machinery companies; was issued in December, 1942, and gives figures up to the end of 1940. The Machinery and Allied Products Institute, 744 Jackson Pl. Washington, D. C., published a report some years ago on Obsolescence and Depreciation Policies. However, we know of no study of machinery costs up to date.—Ed.

BROKEN GRINDING WHEELS

Sir:

What do you suggest to keep hand grinding wheels from breaking and scattering and injuring employees? The usual guard is worthless because it does not cover the wheel. My suggestion was (which was laughed down) that a brass braid be woven into the wheel, similar to non-shattering glass in autos. The brass would interfere with grinding, I am told. Another suggestion was a steel wire mesh guard that would come all the way down, which would stop the wheel when it broke. No soap! These breaking wheels which fly in all directions have injured more employees than I want to go on record for saying and are a constant danger in any shop. They leave cut faces, knocked out teeth and broken glasses in their wake.

Can anyone suggest anything?

DOROTHY DASE
3008 West Grand Blvd.,
Detroit, Mich.

NE STEEL CHART

Sir:

We compliment you on having done an excellent job, which we find will be of use to us and would like very much to get 12 additional copies. We hope they may be available and will send you our check for whatever cost is involved.

H. A. BISSOUT, President

W. K. Mitchell & Co., Inc.,
29th and Ellsworth Sts.,
Philadelphia

Sir:

The chart is very helpful in our expediting work. Could we obtain another copy?

G. W. CREIGHTON, District Manager

War Production Board,
1004 Baltimore Trust Bldg.,
Baltimore, Md.

WORK INCENTIVES

Sir:

We believe one of your recent issues contained an example of incentive systems showing benefit to both worker and employer. The issue containing it seems to have been misplaced in our office. Could you tell us in what issue it appeared?

ERNEST B. FREY, Production Manager

Winfield H. Smith, Inc.,
Springville, N. Y.

● April 29, page 79.—Ed.

MULLINER-ENLUND LATHE

Sir:

We purchased, over twenty years ago, from the Mulliner, Enlund Co., Inc., of Syracuse, N. Y., a 14" Engine Lathe.

We desire to obtain for this machine a compound rest. Will you advise us from which organization we may secure this part?

United Metal Spinning Co., Inc.,
440 Adelphi St.,
Brooklyn, N. Y.

● Mulliner, Enlund Co. went out of business a good many years ago, and as far as we know no other company has carried on this line. A used machinery dealer might be able to supply a compound rest from its stock of used machines.—Ed.

COMING EVENTS

Sir:

Will you kindly advise if you publish "Coming Events" in the same location in the magazine each week.

J. R. STEVENSON, Manager Priorities Div.

Canadian Fairbanks-Morse Co., Ltd.,
980 St. Antoine St.,
Montreal

● We are sorry to be obliged to confess that we do not. Exigencies of make-up and the handling of late news make it difficult to fix the location of this feature. However, we recognize the desirability of having it in the same place each week and are working toward that end.—Ed.

CARBIDE TOOLS

Sir:

Kindly forward to the writer at your earliest convenience, a reprint of the article on "The Control and Use of Carbide Tools in the Shop," written by Gaylord G. Thompson. This article appeared in the May 9, 1940 issue.

WESLEY K. HEATH

Wright Aeronautical Corp.,
Paterson, N. J.

OVERSEAS BOUQUET

Sir:

I should like to take this opportunity of expressing our admiration of the excellent service so consistently given by THE IRON AGE. Apart from

the technical papers, we have found your reports on U. S. Governmental activities extremely helpful, since our work at the moment entails much searching of material of wider and less technical character than anything which we had to cover before the war.

I would add a word of special appreciation of the frequent references to papers previously published, which you insert in new articles. This is a practice which is all too infrequently followed, the value of which can only be fully realized by busy searchers for information.

E. W. PARKER, Librarian

Mond Nickel Co., Ltd.,
England

CHAIN SAWS

Sir:

We are endeavoring to obtain for export 10 pieces of Cutting Chains for power cross cut saws "Dolmar" 1m50 long.

W. J. CONNELLY

Import-Export-Industries, Inc.,
30 Rockefeller Plaza,
New York City

● The Dolmar Chain Saw is of German manufacture and it is not now available. However, there are a number of similar portable power-driven chain saws made in this country suitable for the same purpose. Among the manufacturers of machines of this type are Henry Disston & Sons, Inc., Philadelphia; Van Norman Machine Tool Co., Springfield, Mass.; Mall Tool Co., 7730 S. Chicago Ave., Chicago; and Vulcan Iron Works Co., Denver Colo.—Ed.

FOOLPROOF GAGING

Sir:

While I am not in accord with the article "Foolproof Gaging System" of Sept. 3, 1942, I would appreciate receiving two copies to pass on to other members of our organization for their study and comments.

H. A. MARCHANT

Chrysler Corp.,
Detroit, Mich.

● While industry in general curses the Army Ordnance gaging system because it is too tight and robs the shop of a sizeable part of the tolerance shown on the part drawing, it is still the only system that comes within the principle laid down in the Tentative American Standard for Tolerances, Allowances and Gages for Metal Fits (B4-1925) that "the extreme sizes for all plain limit gages shall not exceed the extreme limits of the part to be gaged." Moreover, this standard, now being revised by an American Standards Association's War Committee at the request of the Automotive Council for War Production, in spite of its title does not contain any specifications for gaging practice nor does it contain specifications for gagemakers' tolerances and wear allowances. The Ordnance Department system *does*, but since these tolerances are subtracted from the part limits on the high and low side, there is often precious little metal left for the shop man to play with. The Ordnance system penalizes fixed types of gages, which are used in countless numbers, and favors visual and other comparator types of gages. Industry would like to have its full tolerance range and foolproofness, too!—Ed.

MORE POWER TO THESE

"JEEPS" OF THE SEA!



**— WITH DIESELS CUSHIONED ON
MUEHLHAUSEN SPRINGS!**

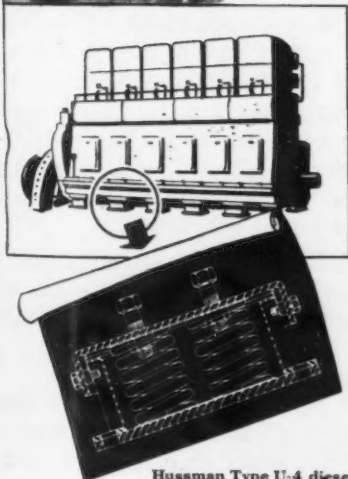
★ This peppery little sub-chaser is on the hunt—to ferret out the lurking enemy. And it's using every ounce of power available.

In the engine room, powerful diesels throb with the thundering strength of a thousand horses—driving this swift, little ship through heavy seas. However, the vibration developed by these engines must be harnessed so that their maximum power may be utilized. To isolate effectively this vibration, diesel engines rest on cushions of steel—coil springs fabricated by Muehlhausen and incorporated in Hussman mountings.

The successful performance of these springs demonstrates the skill with which Muehlhausen engineers solve both the problems created by quantity production and by the exacting working con-

ditions of the application. Such heavy, hot coiled springs must be produced by the thousands to identical load and dimensional characteristics—and made from material which will withstand the corrosive action of salt-laden atmospheres.

Write today for new Armament Bulletin which shows the importance of springs for many types of war equipment. MUEHLHAUSEN SPRING CORPORATION, Division of Standard Steel Spring Company 817 Michigan Ave., Logansport, Indiana.



Hussman Type U-4 diesel engine mounting incorporating Muehlhausen compression springs.

MUEHLHAUSEN
SPRINGS



EVERY TYPE AND SIZE

This Industrial Week . . .

- 3 Million Tons of Ingot Capacity Added
- Transportation Needs in the Spotlight
- Aircraft Steel Setup Shows Improvement
- 3.4 Million Tons of Idle Steel Put to Use
- Ingot Production Rate Dips One-Half Point

AS steel executives assembled in New York this week for their annual meeting Thursday, a glimpse into the current status of the steel expansion program revealed that around 3,000,000 tons of additional ingot capacity has been added since September, 1941, a magnificent accomplishment considering the delays and red tape which cropped up frequently to upset building schedules. H. G. Batchelder, head of the WPB Steel Division, says the industry has helped shorten the war by its expansion.

Records of the Steel Division show that as of May 1 there were 2,083,000 tons of new open hearth and 953,700 tons of new electric furnace capacity in operation. Of the blast furnace program 4,505,000 tons had been blown in May 1. New by-product coke oven capacity May 1 was 2,206,000 tons.

The open-hearth expansion is scheduled to be 99 per cent complete by the end of this year and fully complete by next February. The alloy steel expansion is expected to be completed by October of this year. The blast furnace program, calling for a total of 11,314,000 tons of new capacity, should be completed by November. The by-product coke oven expansion program which calls for a total of 7,448,000 tons will not be completed until December.

STEEL-MAKING capacity will aggregate 97,400,000 net tons when the entire program is completed, including open hearth capacity of 84,404,000 tons and electric furnace capacity 6,403,000 tons. Blast furnace capacity when expansion is completed will be 68,848,000 tons, and by-product coke oven capacity will be 61,963,000 tons.

Facing continued pressure for more production, the wartime importance of the industry's new facilities cannot be overstated. Lend-Lease, one segment of the vast program which lies ahead, will require around 6,500,000 gross tons of iron and steel during the next year. (About 500,000 tons of non-ferrous metals will be shipped, mostly copper and brass.)

A month-end flurry of orders during the past week

has filled the few blank spaces which existed for near-term deliveries of steel. Midwest mills have received additional urgent directives for farm implement steel. Domestic transportation needs are very much in the spotlight, with steel orders for the railroad program being placed in tonnages greater than some authorities expected, with officials of 13 truck companies starting to make 7350 heavy-duty trucks for civilian use, and with a large bus maker planning to resume operations to help alleviate the growing problem in connection with the transporting of war workers.

THE vigorous efforts which have been made to improve the supply of aircraft alloy steel are achieving success. More use is being made of idle or excessive aircraft stocks in aircraft plants to relieve shortages, under a new set-up which gives the aircraft scheduling unit in Dayton, Ohio, full control over the movement of these surplus materials. Meanwhile, the quantity of earmarked aircraft steel carried by official warehouses has been increased as much as five times the amount previously carried. Other efforts to improve the aircraft steel situation include continuing efforts toward substitution of carbon steel for alloy grades in some component aircraft parts; and a new aircraft production planning and control system. A new and comprehensive plan to schedule individually all the extrusions going into the production of aircraft is reported being put into effect by WPB.

In addition to last week's large strikes which tied up important phases of the war manufacturing program, a series of smaller but equally dangerous strikes hit at some parts of the steel industry and a few shipyards on the East Coast as well as coal mines. Among the numerous stoppages in steel was a 10-day "unauthorized" strike of eight charging machine operators at an open hearth house in the vicinity of Chicago, during which 3400 tons of steel was lost. The strike ended following a personal plea of Army and Navy officials.

While the threatened nation-wide coal strike may be forestalled, coal supplies for the manufacture of coke in the steel industry are at a low point at some plants.

THE widely-heralded curtailment of machine tool production, to be accomplished by WPB by next December, probably will not affect such machine tools as spur and helical gear shapers; plane cylinder grinders; certain types of planers; precision boring machines; external thread grinders; special drills and a few other types of equipment. Meanwhile, Lend-Lease demand will take up much of the slack, for appropria-

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tions for machinery and equipment are set at \$504,000,000 for Lend-Lease during the next year.

One of the most interesting chapters of the war as it affects the steel industry has been the locating and putting to use of idle and excess stocks of steel. Around 4,000,000 tons of this material was tied up when the United States entered the war, but today only 600,000 tons remain. These stocks have been disposed of by the Steel Recovery Corp. and have gone into war production.

The steel industry still is buzzing over the threatened revision of tubular goods prices by OPA. Steel companies' ability to sell certain products at a given price has always been predicated upon the knowledge that certain items would help carry the load of the less profitable ones. If the latter are to be depressed or rolled back, the OPA must face the prospect of an intimate study of those products, many of which have been sold at or below cost for the war effort.

The iron and steel industry on the whole will not find it difficult to return to peacetime operations from a technological standpoint, according to a preliminary study of post-war prospects recently sent by the National Resources Planning Board to steel officials for comments. The preliminary draft warns that certain regions and communities will find it more difficult to compete either because of obsolescence or because of increased competition for certain regional markets.

The report, which is subject to final revision apparently after comments are received, indicates that any increases in production beyond pre-war levels must come as a result of increased activity in consuming industries. The distribution of steel among users at high levels of production, it is argued, would

Excess Inventory Steel Has Dwindled

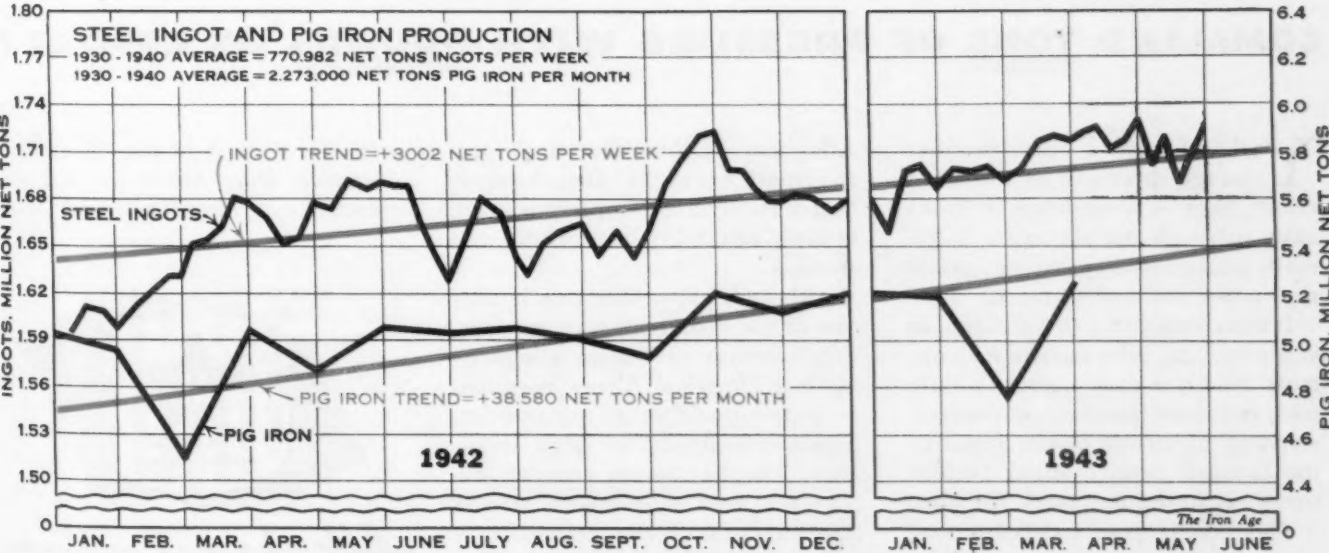
Washington

• • • The myth of millions of tons of excess and idle stocks of steel derived from converted civilian industries has been exploded, it is said here. A high WPB Steel Division official declared on Monday that of the 4,000,000 tons of steel available in excess inventories since Pearl Harbor, only about 15 per cent or 600,000 tons now remain. These stocks have been disposed of by the Steel Recovery Corp. and it is said that of the remaining tonnage no very great selection of sizes, shapes and analyses remain.

probably differ considerably from pre-war consumption owing to likely variations in their rate of growth.

STEEL ingot production this week declined half a point to 98 per cent of rated capacity. Operations in the Pittsburgh district are unchanged at 101 per cent while Chicago output has gained half a point to 97 per cent. Up a full point was steelmaking at Cleveland and a two point gain to 91 per cent has been made in Wheeling. Eastern district furnaces are working at 101 per cent of capacity, up five points from last week. Declines in output are evidenced in Philadelphia, down two points to 93 per cent; Cincinnati, also down two to 103 per cent, and St. Louis where operations have fallen two and a half points to 99 per cent. Youngstown at 93.5, Buffalo at 104.5, Birmingham at 102.5 and Detroit at 104.5 per cent are unchanged from last week's operating rates.

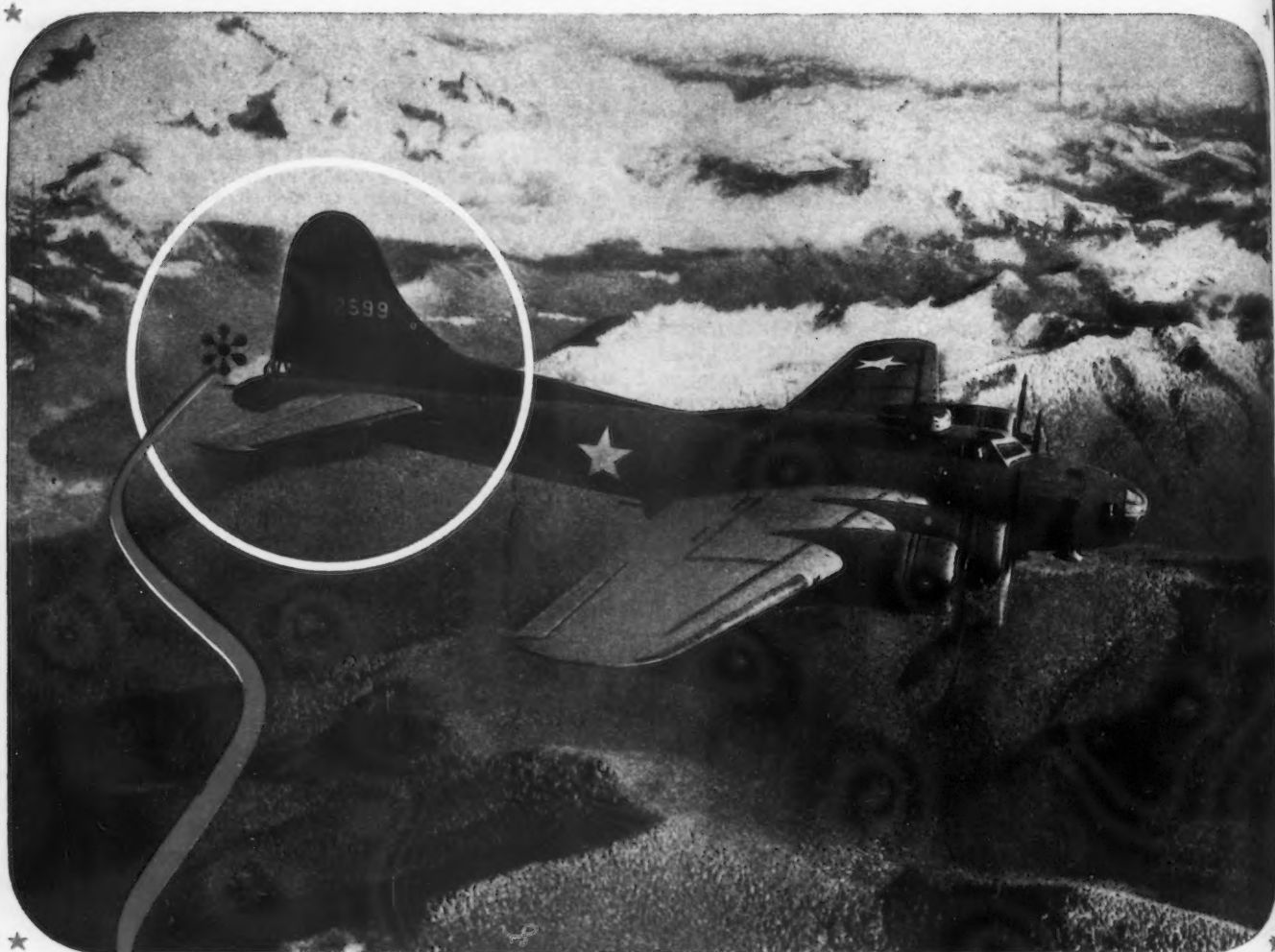
The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	S.Ohio River	St. Louis	East	Aggregate
May 20	101.0	96.5	93.5*	95.0	99.0	104.5	89.0	102.5	104.5	102.0	105.0	101.5	96.0	98.5
May 27	101.0	97.0	93.5	93.0	100.0	104.5	91.0	102.5	104.5	102.0	103.0	99.0	101.0	98.0

* Revised



**How does a Bomber Pilot*

COMMAND TONS OF PRESSURE WITH POUNDS OF EFFORT?

YOU'VE seen a heavy bomber change direction in the air—climb, bank or nose down. It looks easy, although the airstream is actually piling tons of pressure against the rudder and tail surfaces.

It even looks easy in the cabin, as you watch the pilot handle his controls. And it is easy, because a little trick called an "amplidyne"—which steps up electrical power input to the control motors about 10,000 times—is doing the work for him.

This mechanism, a development of one of the nation's largest electrical manufacturers, depends upon the special properties of an

Allegheny Ludlum Electrical Steel to achieve its results. Into the steel, as it must be in the amplidyne itself, is built reliability, uniformity and stamina.

Although important, this is only one of the dozens of wartime electrical devices to which Allegheny Ludlum Electrical Alloys have lent desirable qualities of magnetism, high permeability, or high resistance. The list covers control, detection and communications equipment for all the services.

For engineers and production men desiring certified technical information on these special alloys,

write for a copy of the "*Electrical Materials Blue Sheet*" or for the assistance of our Technical Staff.

ADDRESS DEPT. IA-5



Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

Steel-Makers to the Electrical Industry

A-8826 . . . W & D

Expansion Feats in Steel Have Shortened
The War, Batcheller Says in Revealing
Complete Figures as of May 1



Washington

• • • Steel Director H. G. Batcheller finds a striking parallel in the winning of North Africa and the "magnificent job" the steel indus-

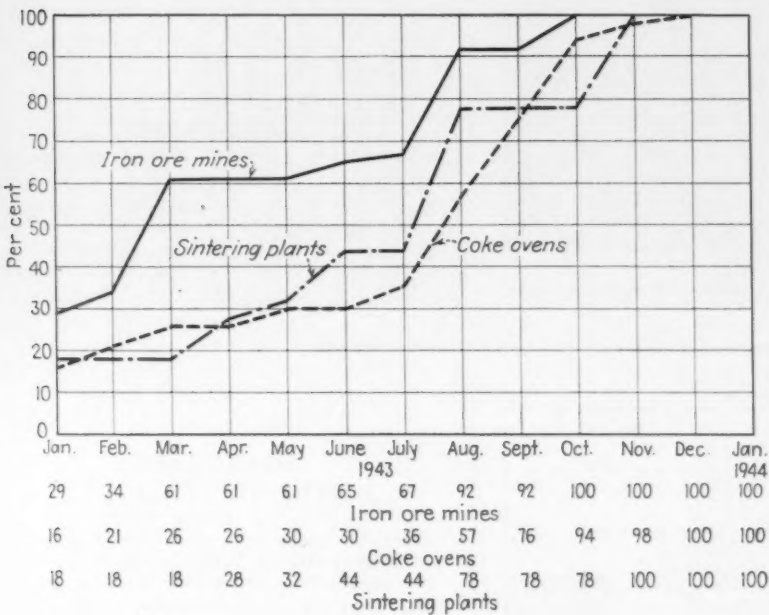
try has done in building 3,000,000 tons of additional steel capacity since September, 1941. Each feat has shortened the war.

Mr. Batcheller told THE IRON

AGE last Saturday that each added ton of new capacity does the same thing. At the same time, he appealed to the steel industry to better its fine record. Mr. Batcheller also declared that the industry deserves high praise for the amount of its 1942 construction, since the severity of the winter hampered building.

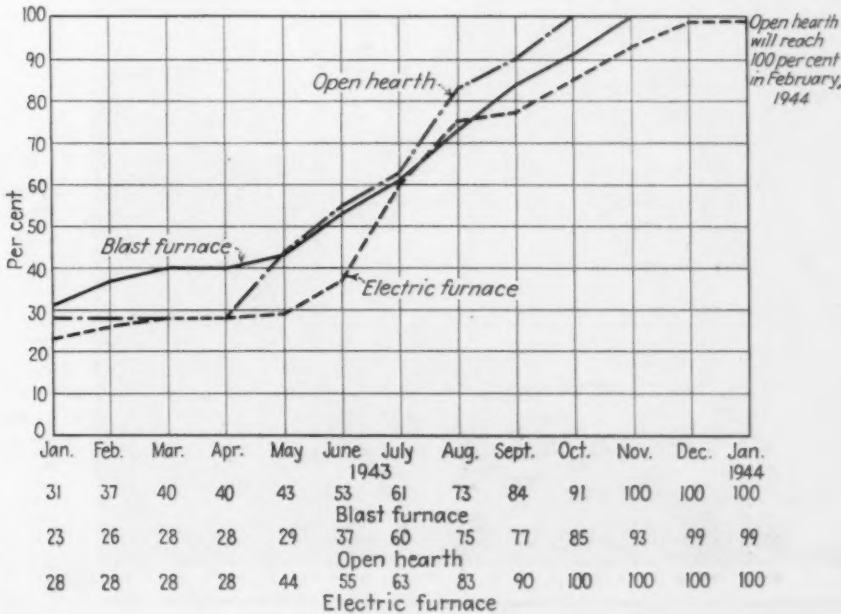
Steel Division records show that as of May 1, there were 2,083,000 tons of new open hearth, and 953,700 tons of new electric furnace capacity in operation. The last unit of the open hearth expansion is to be completed by February, 1944, but it will be 99 per cent complete by the end of December, 1943. The alloy steel expansion is expected to be finished by October of this year.

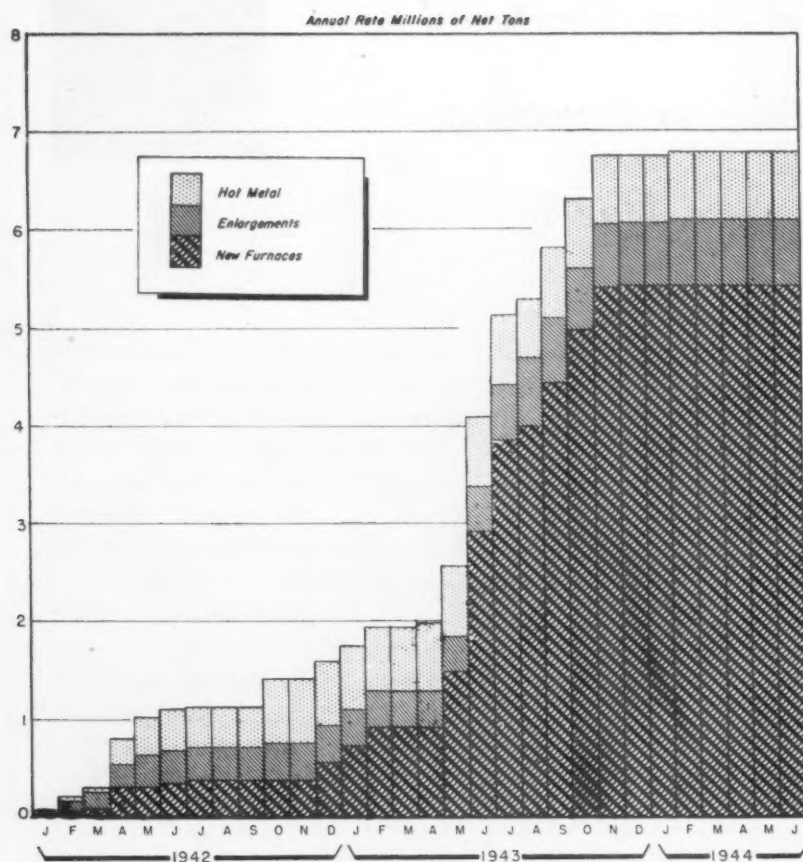
If the program is completed as



ABOVE
• PERCENTAGE OF PROGRAM PLACED IN OPERATION: For iron ore mines, coke ovens and sintering plant projects. Actual prior to April 1, 1943 — estimated thereafter, based on scheduled completion dates as of April 1.

AT RIGHT
• Percentage of program placed in operation for blast furnace, open hearth and electric furnace projects. Actual prior to April 1, 1943 — estimated thereafter, based on scheduled completion dates as of April 1.





Cumulated to End of Month	New Furnaces	Enlarge-ment	Hot Metal	Total
1942				
Jan.		20,000	40,000	60,000
Feb.	30,000	145,000	40,000	215,000
Mar.	80,000	175,000	40,000	295,000
Apr.	300,000	247,000	256,000	803,000
May	300,000	347,000	376,000	1,023,000
June	344,000	347,000	412,000	1,103,000
July	380,000	347,000	412,000	1,139,000
Aug.	380,000	347,000	412,000	1,139,000
Sept.	380,000	347,000	412,000	1,139,000
Oct.	380,000	374,275	652,000	1,406,275
Nov.	380,000	374,275	652,000	1,406,275
Dec.	577,000	374,275	652,000	1,603,275
1943				
Jan.	727,000	374,275	652,000	1,753,275
Feb.	907,000	374,275	652,000	1,933,275
Mar.	907,000	374,275	652,000	1,933,275
Apr.	907,000	374,275	712,000	1,933,275
May	1,488,000	374,275	712,000	2,574,275
June	2,925,000	462,275	712,000	4,099,275
July	3,840,000	570,275	712,000	5,122,275
Aug.	3,990,000	606,275	712,000	5,308,275
Sept.	4,423,000	676,275	712,000	5,811,275
Oct.	4,979,000	676,275	712,000	6,367,275
Nov.	5,413,000	676,275	712,000	6,801,275
Dec.	5,438,000	676,275	712,000	6,826,275
1944				
Jan.	5,438,000	676,275	712,000	6,826,275
Feb.	5,438,000	716,275	712,000	6,866,275

UPPER LEFT

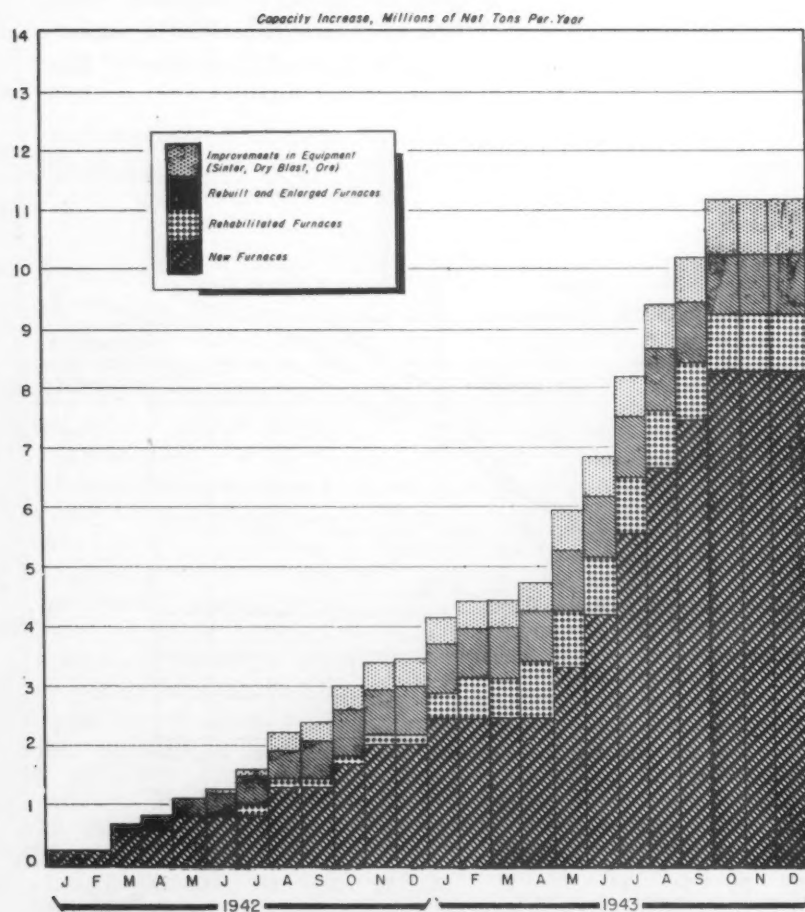
• **INCREASES IN OPEN HEARTH:** The above table and the chart at upper left show the open hearth program in full. As of May 1 there were 2,083,000 tons of new open hearth capacity in operation.

o o o

LOWER LEFT

• **ADDITIONAL BLAST FURNACE CAPACITY:** The table below and the chart at lower left show the blast furnace program in full. On May 1, 4,505,000 tons had been blown in. The rest of the program is expected to be completed in November.

(000 omitted)



Month	New Furnaces	Rehabili-tated Furnaces	Rebuilt and Enlarged Furnaces	Improve-ment in Equipment (Sinter, Dry Blast, Ore)	Total Net Tons
1942					
Jan.	227				227
Feb.	227				227
Mar.	546		131		677
Apr.	546		285		831
May	828		285		1,111
June	826	32	325	62	1,245
July	826	176	469	127	1,598
Aug.	1,258	176	469	319	2,222
Sept.	1,258	176	631	319	2,384
Oct.	1,650	176	749	458	3,033
Nov.	2,010	176	749	458	3,393
Dec.	2,010	176	809	458	3,453
1943					
Jan.	2,442	401	841	458	4,142
Feb.	2,442	667	841	458	4,408
Mar.	2,442	667	841	458	4,408
Apr.	2,442	967	841	498	4,748
May	3,304	967	1,007	676	5,954
June	4,166	967	1,007	676	6,816
July	5,498	967	1,007	676	8,148
Aug.	6,605	967	1,007	746	9,325
Sept.	7,438	967	1,007	846	10,158
Oct.	8,253	967	1,007	931	11,158

NEWS OF INDUSTRY

Total
60,000
215,000
295,000
803,000
103,000
139,000
139,000
406,275
406,275
603,275

753,275
933,275
933,275
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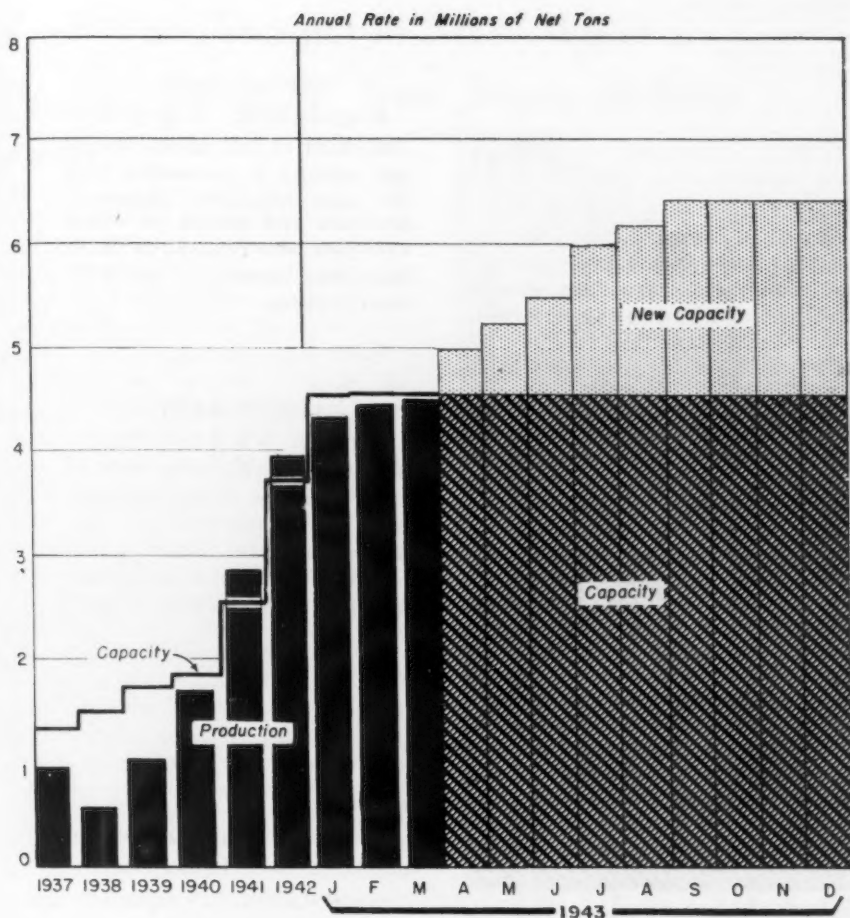
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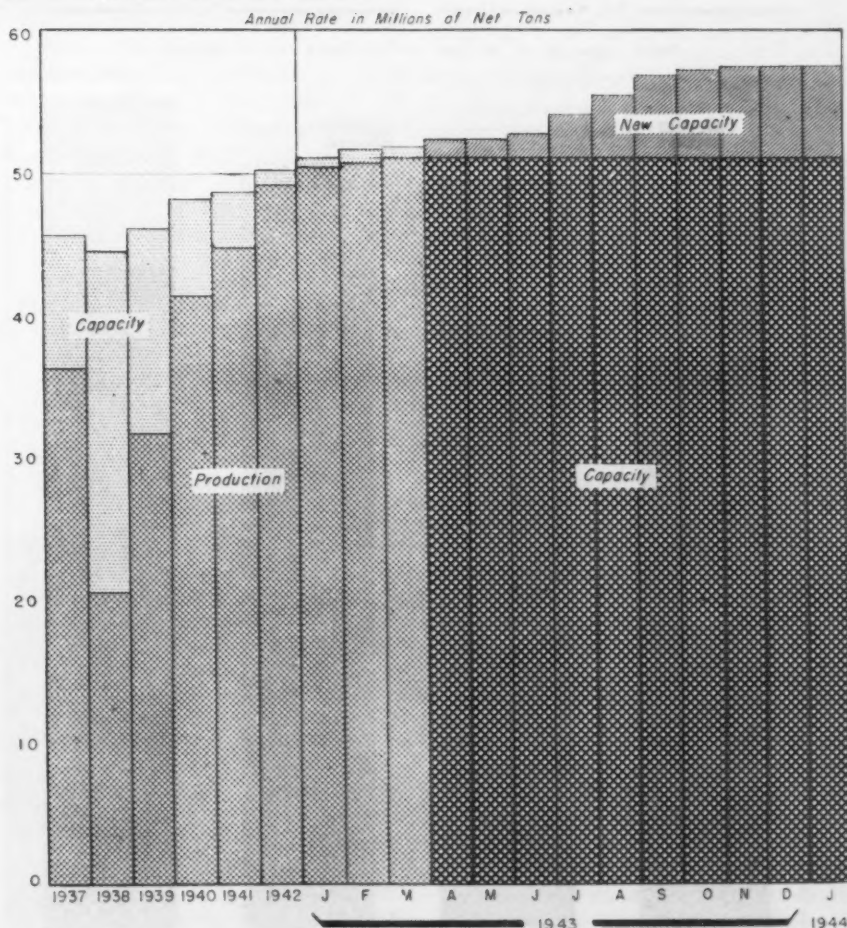
ABOVE

• **ELECTRIC FURNACE CAPACITY AND PRODUCTION:** The chart shows electric furnace capacity and production. Steel Division records show that as of May 1, there were 953,700 tons of new electric furnace capacity in operation. The alloy steel expansion is expected to be completed by October of this year.

o o o

AT RIGHT

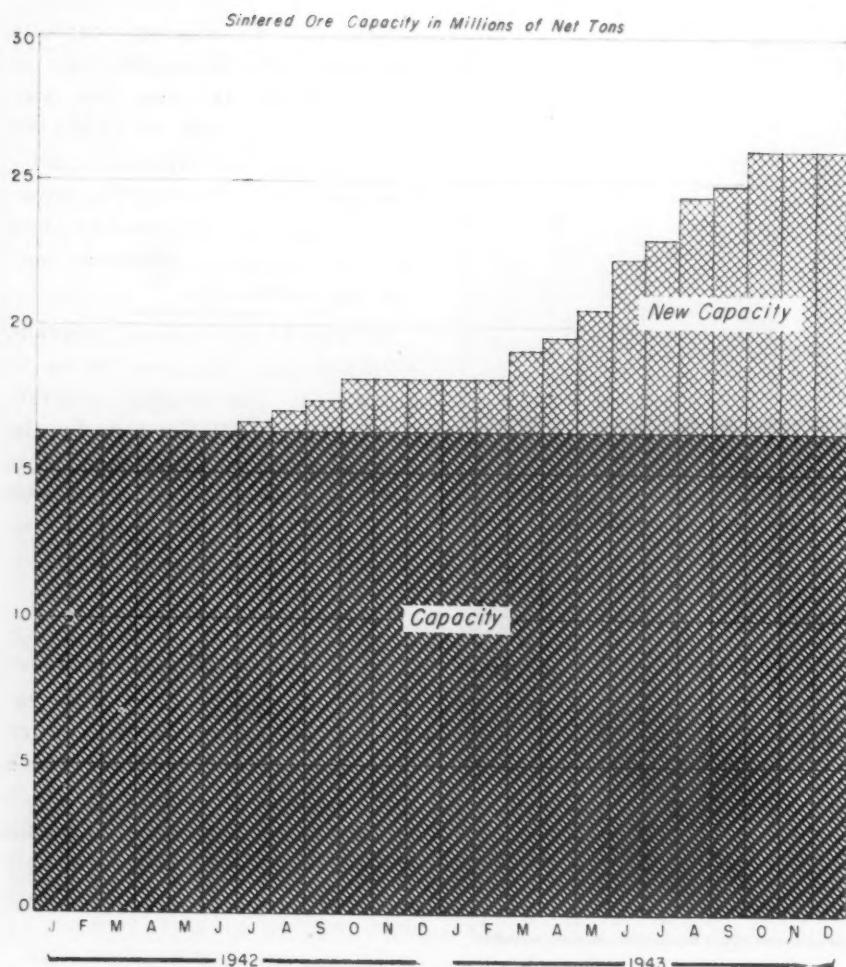
• **BY-PRODUCT COKE OVEN CAPACITY AND PRODUCTION:** The chart shows by-product coke oven capacity and production. Only 2,206,000 tons of new capacity was in operation May 1. The entire expansion won't be completed until December.



scheduled, steelmaking capacity will aggregate 97,400,000 tons on Jan. 1, 1944. Of this, the open hearth capacity will be 84,404,000 tons, and electric furnace capacity 6,403,000 tons. Steelmaking capacity on Jan. 1, 1942, shortly after the United States entered the war, was 88,570,000 tons.

Of the blast furnace program, 4,505,000 tons had been blown in on May 1. The original program was set at 10,945,000 tons by the Steel Division in June, 1942. This has been increased to 11,314,000 tons and should be completed by November, according to Steel Division reckoning.

A corresponding increase in by-product coke oven capacity has also been planned. The June, 1942, figure was 7,083,000 tons. Now, when the capacity of the new ovens which are in operation and those which are scheduled are added, the result is 7,448,000 tons. However, only 2,206,000 tons of new coke oven

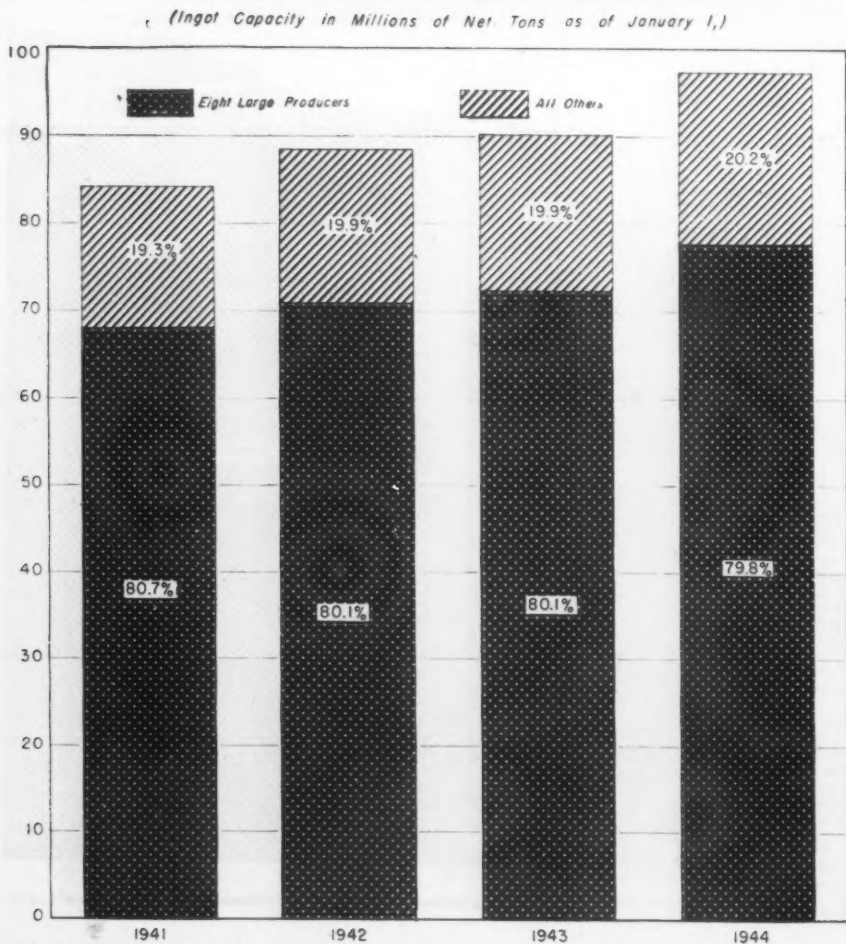


UPPER LEFT

• **SINTERING CAPACITY:** The chart at left shows sintering capacity in connection with the steel industry's expansion program, full details of which have just been released by H. G. Batcheller, director of the WPB Steel Division.

LOWER LEFT

• **HOW SMALL PRODUCERS SHARE:** The chart at left shows how small producers share in the steel industry's expansion program, which is revealed for the first time on this page and the preceding pages.



capacity was in operation on May 1. The entire expansion will not be completed until December.

By-product coke capacity when expansion is finished will be 61,963,000 tons, and blast furnace capacity when expansion is ended will be 68,848,000 tons. By-product coke capacity on Jan. 1, 1942, was 50,064,000 tons, and blast furnace capacity was 59,949,000 tons.

Copper Released for Farm Tractor Parts
Washington

• • • Indicative of the growing employment of women in farm work is an amendment to Order L-170 adopted by WPB on May 18 permitting the use of copper in manufacturing starting motors and headlights for farm tractors. This change was made so that farm tractors may be operated by women and men who lack the necessary physical strength to start the engines by manual cranking, to allow operation of tractors at night time, and to alleviate the manpower shortage. The amended order also permits the manufacture of certain items of farm machinery and equipment requiring rubber tires to the extent that prior to the manufacture of such items specific quantities of rubber tires be made available or released by WPB for this purpose.

Post-War Problem in Steel Won't Be Too Difficult, New Study Asserts

Pittsburgh

• • • The iron and steel industry on the whole will not find it difficult to return to peacetime operations from a technological standpoint—this is a major conclusion reached in the preliminary study of post-war prospects in the iron and steel industry recently sent by the National Resources Planning Board to steel officials for comments.

A preliminary draft (authored by Miss Marion Worthing, who at one time was associated with the University of Pittsburgh Bureau of Business Research and later assisted in the preparation of certain data submitted by the U. S. Steel Corp. to the Temporary National Economic Committee in November, 1939, and January, 1940) warns that certain regions and communities will find it more difficult to compete either because of obsolescence or because of increased competition for certain regional markets.

The report, which is subject to final revision apparently after comments are received, indicates that any increases in production beyond pre-war levels must come as a result of increased activity in consuming industries. The distribution of steel among users at high levels of production, it is argued, would probably differ considerably from pre-war consumption owing to likely variations in their rate of growth.

On the controversial question of a reduction in operating rates below the present level the report states "this is not as serious as it sounds because the industry has usually operated well below theoretical capacity," but adds that the decrease in output would be greater in some centers than in others. In a footnote the author states that "roughly speaking, rates of operation above 50 per cent are profitable but, of course, to a varying degree among plants."

NOTE—The author apparently has in mind the "break-even point" which was a favorite topic several years ago. With average hourly wages per employee up, with composite base prices down since 1936, and with taxes much higher, it is believed that a break-even point after the war would be at a somewhat higher point than 50 per cent of operations. Some observers believe that the break-even point after the war might require an operating rate of 65 or 70 per cent of operations.

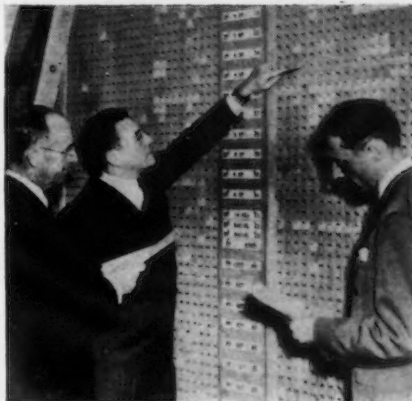
Referring to potentialities after the war, the author believes that geographical distribution of steel capacity will be substantially the same as before. The report warns that the post-war period will find some extreme over-capacity in a few particular products and in equipment for special treatment of war time goods.

With respect to post-war production, the author believes that an output at or near rated capacity would not immediately present a serious problem although some readjustments because of the return of normal markets, etc., would be necessary. If, however, steel production reverts to pre-war levels, many problems, it is said, will arise related to the selection of plants in which the bulk of post-war production will take place.

The author sees, as operating rates decrease, the possible abandonment of obsolete plants apparently because everything was being used that would run in order to meet actual war demands.

The question of a possible shortage of raw materials for the iron and steel industry is briefly dismissed on the basis that temporary bottlenecks are the result of greatly increased demands during a short period of time. The author indicates that national reserves of coking coal are adequate although reserves in some areas are being depleted, but adds

PROGRESS BOARD: At the scheduling board which charts progress in production of flow meters and industrial control instruments are, left to right, E. B. Evleth, vice-president, K. R. Knoblauch, special assistant, and D. C. Carter, factory manager, Brown Instrument Co., Philadelphia.



that reserves in other areas can be developed for commercial use.

NOTE—This viewpoint on raw material is predicated on a lower rate of operations during the post-war period. If circumstances would support a maximum steel production rate for some time after the war, it might be found for instance that coking coal reserves are not as adequate as has been indicated.

The author looks for a heavy post-war demand for steel from all types of civilian industries. This immediate consumption by individual industry groups, the report argues, probably will differ from usual pre-war distributions. Variations might be caused by reduced requirements for industries which have been relatively well supplied for war purposes and by slow re-conversion.

A brief summary of the author's discussion of post-war requirements from various industries follows.

AGRICULTURE—Post-war steel sales for farm implements should be good with eventual greater use of implements than even before.

AIRCRAFT—It is possible that the steel industry may contend strongly with aluminum, plywood, and plastics industry for a large part of this market. It is warned that peace-time market for aircraft will be relatively small as compared with present requirements.

AUTOMOBILES—A very large market for both passenger cars and trucks can be expected immediately after the war. The author believes the steel industry may find that whether or not further expansion takes place in automobile sales, the demand for steel may not increase proportionately or may increase.

RAILROADS—Present prospects for maintenance of railroad traffic at a high level after the close of the war are not very promising. Hence, in the long run steel requirements except for repairs and maintenance might not be very large. If unusual financial support became available with the railroads sharing in federal loans for public works, railroad rehabilitation plans might result in a heavy demand for steel. Immediate post-war steel requirements by the railroads will, of course, be heavy owing to deferred maintenance, etc.

CONSTRUCTION—Steel demand will depend heavily on public works programs such as slum clearance, housing, highways, etc. The author sees favorable opportunities for steel in prefabricated houses.

SHIPBUILDING—After the war, it is expected, shipbuilding will settle down to normal replacement.

EXPORTS—In the long run we should expect to lose much of the market, both to foreign mills which were in production before the war and to new ones now being built. The author probably assumes this opinion to cover that post-war period after the period of rehabilitation.

Touching on the disposition of government financed steel plants, the author believes that detached facilities can be disposed of to private interests if prices are low enough; but in cases where projects have been "scrambled," the disposal will be more difficult. This whole problem, it is said, is clouded by the inability to guess how active the government will be in the post-war readjustment period.

Master Surplus Stock Registers of ASU Employ Idle or Excessive Surplus Aircraft Materials Through Controlled Redistribution

Dayton, Ohio

• • • The problem of making use of idle or excessive surplus aircraft stocks in aircraft plants to relieve shortages which crop up in not only the aircraft but the entire war production program, is being licked under a new set-up which gives the Aircraft Scheduling Unit at Dayton, Ohio, full control over the movement of these surplus materials. It also establishes central clearing houses in which records are kept of surplus aircraft stocks all over the country. From these records it is possible to redistribute materials wherever they are most needed.

The plan calls for redistribution of idle and excessive surplus materials into three channels:

1. Utilization within the aircraft industry in its present, or "as is" form.
2. Utilization by war contractors other than aircraft in its "as is" form.
3. Utilization of obsolete aircraft materials by remelters. Aircraft plants are assisted in the transfer of their obsolete materials to remelters through one of the Government's federal recovery agencies described below.

Full authority over the movement of such surplus materials has been

granted to ASU by proper directive.

Through this three-way redistribution procedure ASU is striving to accomplish four objectives: (a) to relieve critical shortages in aircraft or other war plants; (b) to supply its own warehouses, which are located at strategic points and which will keep the "pipe line" full from mill to factory; (c) to furnish AAF modification centers with materials that are needed to alter, repair and maintain aircraft; (d) to relieve pressure on suppliers by referring purchasers to an existing surplus, rather than placing new orders.

Briefly, the system functions along the following lines: Each aircraft contractor who has been specified to participate will submit a quarterly report on idle and excessive surplus aircraft materials. "Idle" has been defined to include materials on hand in the plant but not needed to fill contracts. "Excessive" refers to stocks which are needed to fill contracts on hand but are greater than 60 days' requirements. Reports will be made on steel,

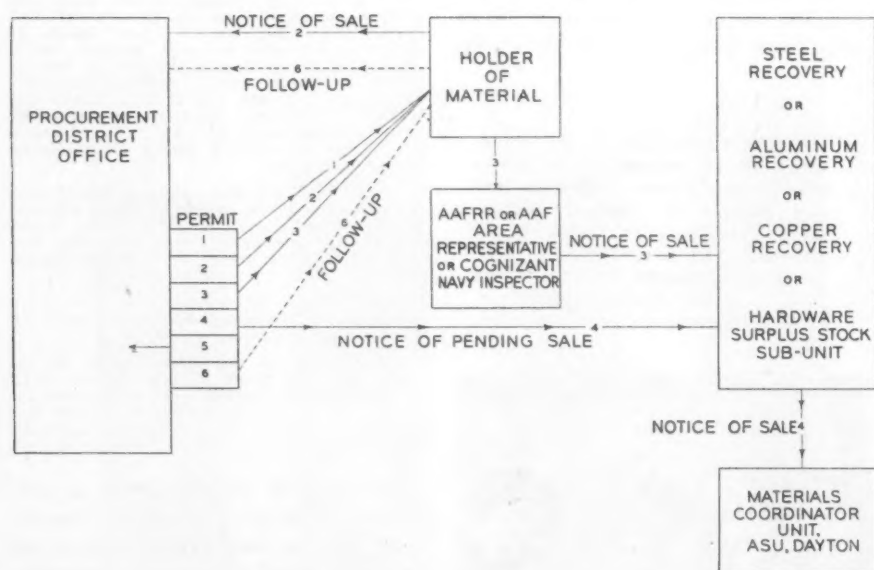
copper, aluminum and aircraft hardware.

These reports have been designated ASU-41 S, A, C and H: S is the code for steel, A for aluminum, C for copper, and H for hardware. They will be channelled through the contractor's Plant Materials Coordinator and forwarded both to his AAF procurement district office and to the proper federal recovery corporation. Three of these are federal agencies under administrative management of WPB's Redistribution Division. They are: Steel Recovery Corp., Pittsburgh; Copper Recovery Corp., New York City; and Aluminum Recovery Section, Murray Cook, Inc., New York City. The fourth is the Surplus Hardware Sub-Unit, Material Distribution Branch, Dayton, which operates for ASU.

Upon receipt of this report of idle or excessive surplus stocks, the recovery corporation will process the information with its machine tabulating system. The data obtained from the quarterly reports of the designated aircraft manufacturers will be incorporated into a "Master Surplus Stock Register." This register, showing the status of surplus stocks in plants all over the nation, will be held at the offices of the recovery corporation for exclusive use of ASU and its liaison officer representative who will be stationed at the recovery corporation. This liaison officer is appointed by the Production Resources Section, Materiel Command, of the Army Air Forces at Dayton, which acts as ASU's operating agent. Within the Production Resources Section, the Materials Coordinator, Major A. M. Baehr, under Lt. Colonel A. E. R. Peterka, chief of the Material Distribution Branch, maintains and operates this system.

The job of the liaison officer stationed at a "recovery corporation" is to handle all direct inquiries made by the four procurement districts as to where surplus stocks may be located. At each "recovery corporation" a TWX teletype service has been installed connecting with the four AAF Procurement District Offices. This enables a procurement district in search of certain steel stocks for relieving a critical shortage to communicate directly with the Steel Re-

PERMIT AUTHORIZING TRANSFER OF MATERIALS



- 1—File copy for holder of material.
- 2—Notice of sale—returned by holder to District Office on consummation of sale.
- 3—Notice of Sale by holder to AAFRR, AAFAR, or Cognizant Navy Inspector for transmission to appropriate Liaison Officer at Recovery Unit or Hardware Sub-Unit.
- 4—Notice of pending sale. Becomes notice of definite sale after "3" reaches destination. After information from "3" is noted thereon, "4" is forwarded to ASU, Dayton.
- 5—District Office suspense and file copy.
- 6—Follow-up copy. Used five days after date of permit if copy "2" is not received by District Office.

covery Corp. in Pittsburgh. Here an immediate search in the master surplus stock register can be made, and within a few minutes the district is given a "yes" or "no." If the answer is "yes," the district is told where the item is and how much is available. In addition, catalogues will be issued by the recovery corporations to the four procurement district offices listing the surplus material available for redistribution.

Each liaison officer at a "recovery corporation" will be kept informed of the following:

1. All critical shortages that cannot be relieved within a Procurement District.
2. What critical aircraft materials are needed for warehouse stocks.
3. What aircraft materials are needed for supplying-modification centers.
4. What raw materials are needed by aircraft contractors who have filed CMP bills of materials with ASU but cannot obtain delivery from suppliers within the necessary time. ASU handles the CMP Claimant Agency responsibilities of the Aircraft Resources Control Office.
5. All movements of idle and excessive surplus materials carried on the Master Surplus Stock Register. This information, of course, is essential to keep the register current at all times.

The liaison officer also will be responsible for reviewing the master surplus stock register to determine which items of surplus materials that are idle have been on the register for at least 30 days without being moved into use in their "as is" form elsewhere in the aircraft industry. Such items may be declared unusable insofar as the aircraft industry is concerned. They will then be dropped from the register and turned over to the recovery corporation. In other words, ASU grants the Redistribution Division of WPB, through its corporation, authority to dispose of the materials to other war contractors. The corporation will then post the information about the item on its own national surplus stock register for possible movement to war contractors outside the aircraft industry.

If, after a reasonable time has elapsed, no other war contractor has need for this unusable aircraft material in its "as is" form, the corporation will then assist the aircraft contractor to dispose of this obsolete item to authorized remelters at prevailing scrap prices.

To complete the procedure under this plan, let us assume that the liaison officer at the Steel Recovery Corp. has been able to locate a certain item requested by the eastern procurement district office of the Army Air Corps. This item, he finds by consulting the register, is in stock in a plant on the West Coast. He immediately teletypes the eastern procurement district office, which in turn passes on the in-

formation to the plant which needs the item and advises this purchaser-to-be to place his purchase order with the known holder on the West Coast. At the same time the western procurement district office is notified by teletype of the pending sale and they in turn issue a permit number to the holder authorizing the sale.

Thus by setting up "paper warehouses," which is what the master

surplus stock registers really are, ASU has organized a gigantic "service" program to help aircraft and other war contractors forestall possible production stoppages. It represents, moreover, the joint effort of both the Army Air Forces and the Bureau of Aeronautics of the Navy to put every piece of surplus aircraft material to use and to give added impetus to the slogan, "Fly 'em away."

Aircraft Steel Warehouse Program Contains Changes to Ease Shortages

Dayton, Ohio

• • • The new, enlarged aircraft steel warehousing program announced by the Steel Division of the WPB contains four important changes that are aimed at solving critical shortages. The changes are:

1. An increase in the quantity of steels carried by the warehouses. This increase has been as much as five times the amount previously carried.
2. The amount of material which the warehouse may ship in a given period has been changed from a quarterly to a monthly basis.
3. Aircraft manufacturers may issue blanket certificates to cover all future orders on warehouses.
4. Number of warehouses has been increased from 16 to 26.

The new program will be controlled by the Aircraft Scheduling Unit

which consists of Col. E. M. Powers, the Army Air Forces representative and administrator of the unit; Capt. C. H. Gillilan (SC) U.S.N., Bureau of Aeronautics Representative; and Col. William S. Cave, British representative. The detailed operations will be handled by Capt. A. F. Hitchiner, operating under the supervision of Major A. M. Baehr, chief, Materials Coordinator Unit, and Lt. Col. A. E. R. Peterka, chief of the Material Distribution Branch. This is a branch of the Production Resources Section, headed by Col. E. W. Rawlings, which carries on part of the operations for the Aircraft Scheduling Unit.

The purpose of the program is to

"TANK-BUSTERS": RAF Hurricane 11B fighters, designed primarily for attacking armored vehicles, are fitted with heavy caliber guns weighing about 320 lb. The guns are capable of automatic or single-shot fire.



supply aircraft manufacturers with both their small and emergency requirements of critical aircraft alloy steels. It will also serve in redistributing surplus alloy steels which may accumulate in the plants of aircraft manufacturers.

The warehouses are located in 26 cities in 11 states and were chosen by the aircraft industry itself.

In general, only standard aircraft alloy steels will be earmarked in these warehouses but special provisions have been made to stock one warehouse with certain "non-standard" sizes and grades which are used by the industry in quantities too small for mill production. If a manufacturer is unable to secure a non-standard item in this warehouse he should immediately notify the Army Air Forces or Bureau of Aeronautics representative in his Procurement District Office and request their assistance. If the district office approves this request, it will forward its recommendation to the Aircraft Scheduling Unit in Dayton, which will arrange for the production of a minimum mill quantity. The amount required by the manufacturer will

then be shipped to him and the balance placed in the warehouse stock.

Both welded and seamless steel tubing will be carried by the warehouses but since seamless tubing production facilities are extremely limited manufacturers should make full use of welded tubing and avoid requesting more critical items.

The material stocked in these warehouses is restricted for use inside the United States except in two special cases where it may be used in the Dominion of Canada. These earmarked aircraft steels may be used only for aircraft construction, maintenance, repair, and airborne parts including the airframe, engine, propeller, accessories and any other regular equipment for the airplane. These steels may not be used for jigs, fixtures, or ordinary ground equipment.

Warehouses may release the aircraft steels in only three ways:

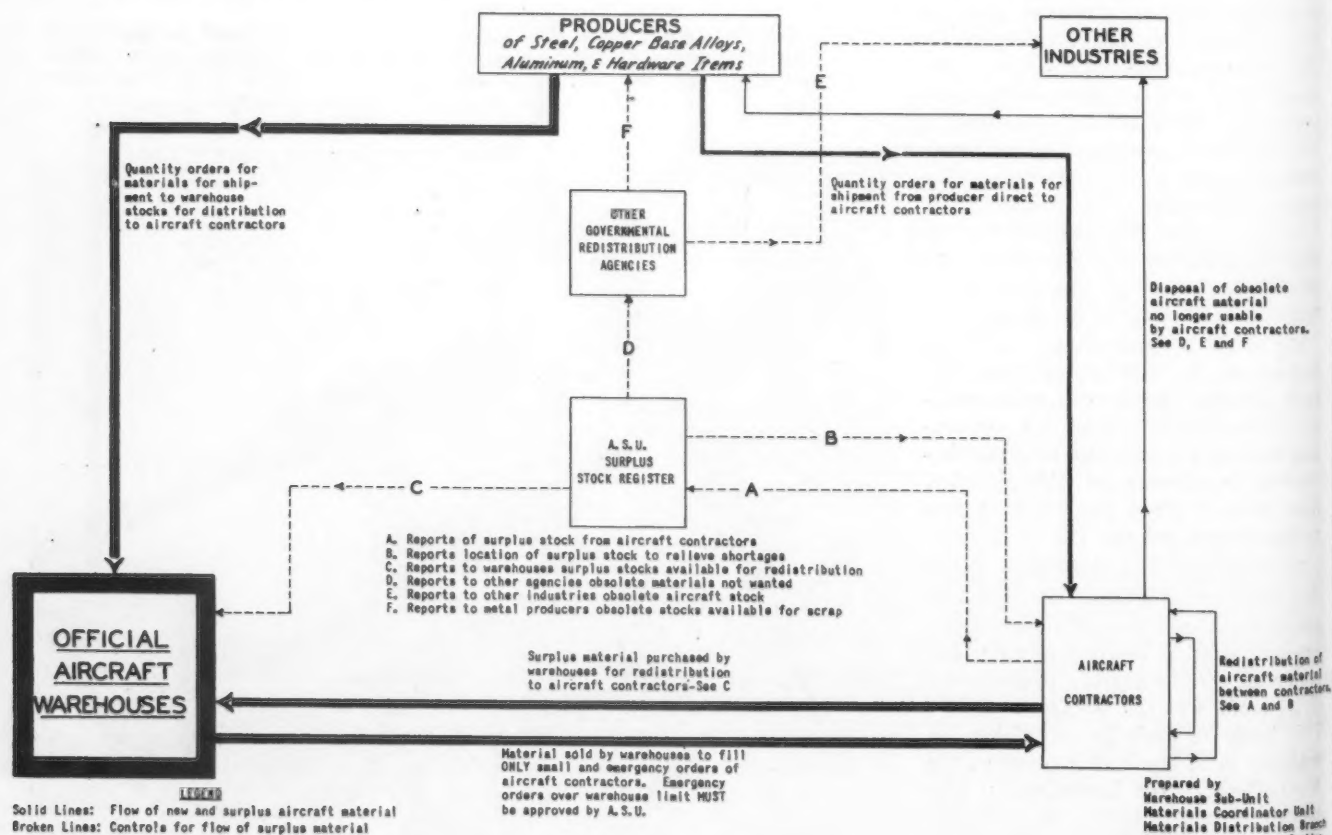
1. Directly to the manufacturers of the approved parts.
2. To modification centers and Army and Navy Supply depots.
3. For the maintenance or repair of aircraft and airborne equipment.

Procedure for obtaining steel from

the warehouse is quite simple. The manufacturer will place his order with the nearest warehouse and if the material is not available in this particular warehouse he may notify the Aircraft Scheduling Unit, which will try to locate the material in one of the other designated warehouses. If the steel is not stocked by any of the 26 warehouses but has been ordered by one of them—and if the need of this steel can be classed as an emergency—the manufacturer should obtain proper certification from his procurement district office. The Aircraft Scheduling Unit will then order the warehouse which is to receive the steel to ship the required amount to the manufacturer even though the warehouse has accepted predated orders for this same steel.

In the scheduling of his production the manufacturer must remember that in any calendar month he cannot place an order for the purchase of warehouse stock of any one size and specification in quantities equal to or greater than those shown in the Earmarked Stock Directive No. 6. Manufacturers who do not have a copy of this directive may secure

FLOW OF MATERIAL THROUGH OFFICIAL AIRCRAFT FACTORIES



one by writing their Procurement District Office or the Aircraft Scheduling Unit, Dayton, Ohio. In the case of a production emergency this ruling may be relaxed but only with the approval of the Aircraft Scheduling Unit.

If the manufacturer should need a quantity greater than that contained in Directive No. 6, he should immediately notify his Procurement District Office which will in turn certify the emergency to the ASU.

To speed up deliveries of the steel from the warehouse, manufacturers may now use a blanket certification. This certification will state that the steel requested is to be used only on authorized products and this will be accepted by the warehouse unless it has reason to believe the material will not be used as specified. In such cases the warehouse may withhold shipment pending an investigation by the Procurement District Office.

In order to maintain the proper balance of stock in the warehouse and prevent tying up important materials, warehouses will not set aside certain lots for longer than seven days awaiting receipt of the purchase order.

An added feature of the program makes it possible for the warehouse to assist the manufacturers in the redistribution of surplus stocks. The warehouse will be notified by the Aircraft Scheduling Unit when such surplus stocks are available and they have been instructed to purchase them from the manufacturer whenever possible. Thus the manufacturer will be relieved of the necessity of filling small orders from other contractors and will be saved considerable expense.

A detailed copy of the program, the Earmarked Aircraft Stock Directive No. 6 and a complete list of steels to be stocked by the warehouse may be secured from the Procurement District Offices or the Aircraft Scheduling Unit, Dayton, Ohio. Following is a complete list of the names and addresses of official aircraft steel warehouses:

Aircraft Steel & Supply Co., 415 N. Water Street, Wichita, Kansas; Baker Steel & Tube Co., 955 S. Alameda Street, Los Angeles; Columbia Steel Co., Seattle; Crucible Steel Co., Halcomb Warehouse, State Fair Boulevard, Syracuse, N. Y.; Ducommun Metals & Supply Co., 4890 S. Alameda Street, Los Angeles; Edgcomb Steel Co., 430 Hillside Avenue, Hillside, N. J.; Peter A. Frasse & Co., Inc., 17 Grand Street, New York; Peter A. Frasse & Co., Inc., 3921 Wissahickon Avenue, Philadelphia; Garrett Supply Co., 3944 Santa Fe Avenue, Los Angeles; Hamilton Steel Co., Taft Avenue, Cleveland; Earle M. Jorgensen Co., 5311 Clinton Drive, Houston, Texas; Earle M. Jorgensen Co., 10510 S. Alameda Street, Los Angeles; Metal Goods Corp., 16 Drennan Street, Houston, Texas; Metal Goods Corp., 5239 Brown Avenue, St. Louis;



MOSQUITO BOMBER: In this Canadian plant a lot of glue goes into the world's fastest fighter-bomber, the DeHaviland Mosquito. Workers are spreading glue on the outer wood skin surface before the skin is fastened to the wing section and screwed on.

Miller Steel Co., 49 Empire Street, Newark, N. J.; Joseph T. Ryerson & Son, Inc., Rockwell Street, Chicago; Joseph T. Ryerson & Son, Inc., Front Street, Cincinnati; Joseph T. Ryerson & Son, Inc., 5 Clinton Street, St. Louis; Joseph T. Ryerson & Son, Inc., 203 Westside Avenue, Jersey City, N. J.; S.A.E. Steel Co., 1420 East 47th Street, Cleveland; Service Steel Co., 1435 Franklin Street, Detroit; U. S. Steel Supply Co., 1319 Wabansia Avenue, Chicago; Wheelock-Lovejoy Co., 288 Court Street, Buffalo; Wheelock-Lovejoy Co., 3201 Bellevue Avenue, Detroit; Chicago Steel Service Co., 39th and Ashland Avenue, Chicago; Aircraft Steel & Supply Co., Dallas, Texas.

Army Air Forces Procurement District Offices may be addressed as follows: (Bureau of Aeronautics Representatives are also located in these offices):

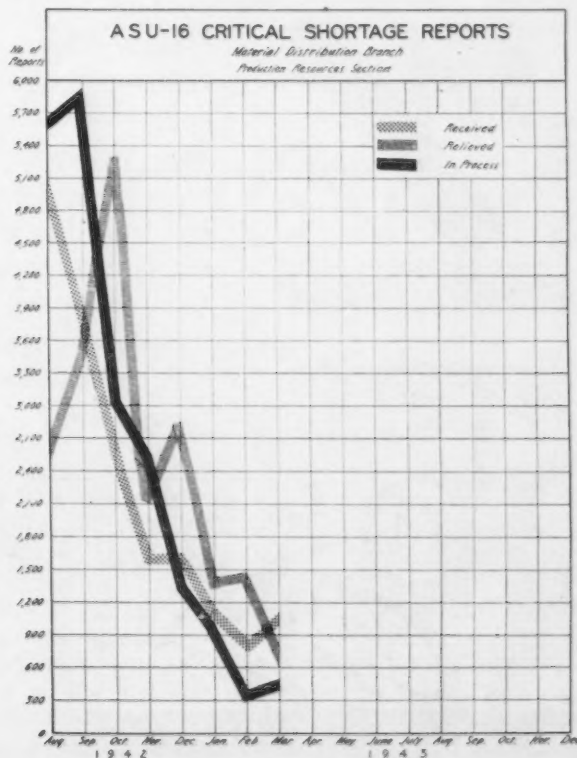
District Supervisor, Eastern Procurement District, AAF Materiel Command, 11th Floor, 67 Broad Street, New York.

District Supervisor, Central Procurement District, AAF Materiel Command, 8505 West Warren Avenue, Detroit.

District Supervisor, Midwestern Procurement District, AAF Materiel Command, Municipal Airport, P.O. Box 117, Wichita, Kansas.

District Supervisor, Western Procurement District, AAF Materiel Command, 3636 Beverly Boulevard, Los Angeles.

CRITICAL SHORTAGES HIT NEW LOW: This chart illustrates the critical shortages received, relieved and in process in the production resources section of the Material Command. Evidence that aircraft manufacturers have been helped is shown by the drop in critical shortage reports in process in the last eight months.

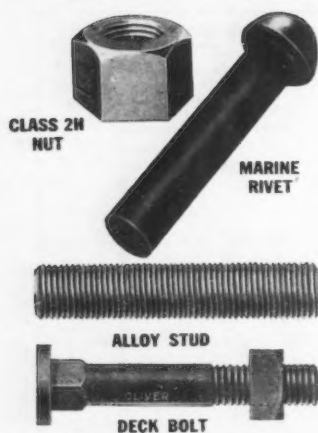


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White Will Resume Making of Busses

Cleveland

• • • A sign of the times is indicated by the fact that White Motor Co., here, is tooling up to begin production of busses and motor coaches. Exactly when production will begin is not yet known because a great deal hinges upon how quickly materials can be obtained.

A release on materials has been granted for the second quarter, and it is hoped that before July 1 assemblies will be started. The need for more extensive transportation facilities in war production areas, it has been realized, is so acute that equipment to supplement that now in service must be forthcoming.

White, one of the largest producers of trucks, has been working almost entirely on medium and heavy trucks and allied equipment for the Army, and the conversion to bus construction is the first work of its kind since the beginning of the war.

Canada Has Excess Special Steel Supply

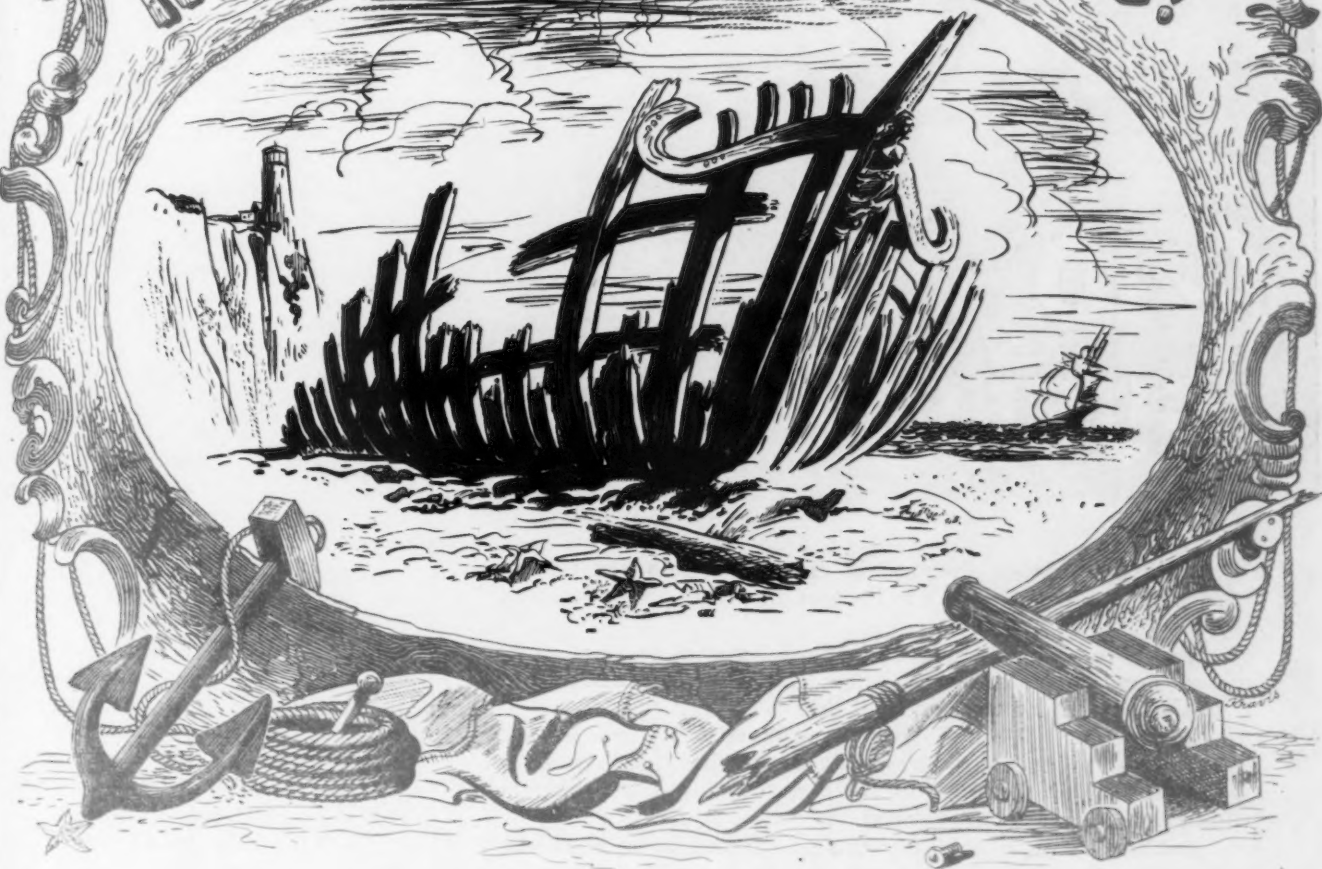
Toronto

• • • For the first time in more than three years Canada is faced with an over-supply of special alloy steel, for which buyers are being sought. Curtailment in production of certain guns already has resulted in curtailment in use of alloy steel. Some of this special material has found its way into warehouses and dealers are seeking an outlet for these new stocks. However, it is not expected that this surplus will last for a long period as it is of special analysis prepared for production of the guns mentioned above. It also is stated that new types of offensive guns are to be produced in some Canadian plants as soon as tooling can be completed and this new enterprise will take up any slack in demand for alloy steels.

In so far as other types of steel are concerned demand continues well in excess of supply and mills are steadily adding to backlogs. Fresh orders for carbon bars are pouring in and mills now are booked solid to the end of this quarter with large tonnage overflow into the third quarter.

Under a new order, Canadian steel mills are no longer permitted to disclose information regarding various rolling schedules to customers or other interests.

REMEMBER THE BARNACLE!



With that curtly classic reminder, one of America's most famous research engineers replied to a man in the act of rhapsodising about the wonderful ingenuity of man.

For the barnacle, he pointed out, is a symbol of all those things that have *not* been done—a tiny marine organism that costs us millions every year—simple, "impossible" things that are still to be accomplished.

The development of lighter and stronger alloys, permitting 3, 5, or even 10 horsepower for every pound of engine weight, instead of one-to-one . . . cheaper color photographs and faster engravings and better television . . . swifter ways of making and working new super-hard alloys . . . scores of different kinds of rubber "growing" on factory floors, and fuels 3 or 4 times as powerful as 100-octane gasoline . . . even solar energy, and atomic power, and—remember the barnacle! These are but a few from a list of certainties and possibilities as long as man's imagination.

Under the secrecy of forced-draught war research, many incredible accomplishments—seemingly impossible within

our time—have already occurred. For obvious reasons, these may not be discussed, but of one thing we can be certain: The end of this war will inaugurate the greatest era of industrial surprises since the age of machining began.

And the shift to light metals and plastics may be as consequential as the shift from bronze to iron!

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NEWS OF INDUSTRY

WMC Sets Up New Labor Appeal Plan

Washington

• • • Machinery for appeals by employees and employers from any War Manpower Commission action under employment stabilization plans, the 48-hr. week policy and other manpower regulations was set up by WMC Chairman Paul V. McNutt with the promulgation of Regulation No. effective May 22.

The new regulation prescribes when may appeal, actions from which workers may appeal, actions from which employers may appeal, notification of the right to appeal and officials of committees to whom appeals are originally taken. After decisions on original appeals, further appeals to the Regional Management-Labor War Manpower Committees and to the Chairman are possible.

A worker may appeal whenever the War Manpower Commission refuses to refer him to, or consent to his being hired for, employment in which, under an applicable WMC order, regulation or other direction he may be hired only upon referral by, or with the consent of, the War Manpower Commission; or when the Commission refuses to issue to him a statement of availability; or requires or permits his employer to release him under a WMC policy, regulation or other direction; or determines that he is violating, or has violated any provision of any order, regulation or other direction of the War Manpower Commission.

Employers, under the regulation, have the right to appeal whenever the War Manpower Commission refuses to refer, or to consent to his hiring a worker or workers if, under an applicable War Manpower Commission order, regulation or other direction, he may hire such worker or workers only upon referral by, or with the consent of the War Manpower Commission; or issues a statement of availability to any of his workers; or requires him to release, or refuses to permit him to release, any workers; or determines that he is violating, or has violated any provisions of any order, regulation or other direction of the War Manpower Commission.

Esty Foster in New Position

Washington

• • • Esty Foster has been appointed chairman of the Non-Military Supplies Committee of the Combined Production and Resources Board.

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Thompson FEATURES INCLUDE:

Fast, convenient operation. Hydraulic Table Movement Throttle, Hydraulic Head Movement Throttle, size control, is available as an auxiliary device. Table reverse instantly variable at touch of operator.

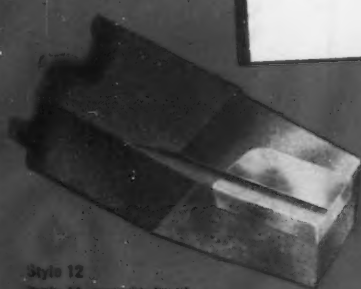
Hydraulic automatic down feed of the wheel head unit, with an automatic trip that is pre-set for size control, is available as an auxiliary device.

Pratt & Whitney lubricated ways. Extra length box type bed. No table overhang. Accommodates larger variety of work and sizes within rated capacity of the Machine.

Pioneers of automatic wheel truing with a simple and effective device in position and used in conjunction with hydraulic truing feeds to the wheel head.

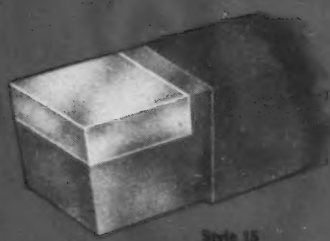
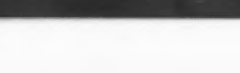
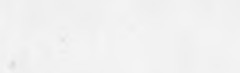
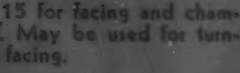
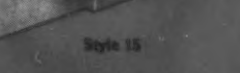
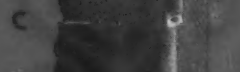
The Thompson Grinder Co., Springfield, Ohio

Use the Right KENNAMETAL* CARBIDE TOOL *For your steel-cutting job*



Style 11, carbide tool

A—Style 11 for rough turning, B—Style 12 for rough facing—where square shoulder is not required, C—Style 12 for large boring, not to a square shoulder.



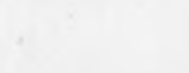
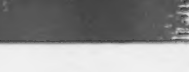
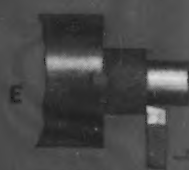
Style 15

D—Style 15 for facing and chamfering. May be used for turning or facing.



Style 3, opposite hand

E—Style 3 for turning, F—Style 6 for facing—to a square shoulder, G—Style 6 for large boring, to a square shoulder.



THIRTY-SIX tool styles in four grades of KENNAMETAL are manufactured by McKenna Metals Company to provide metal machining plants with the correct tool for any specific type of operation.

These tools are designed to give highest possible production on steel-cutting operations with the least tool consumption. The variety of tool styles available eliminates the need for restyling your stocked tools in order to do a different job; there is a KENNAMETAL tool designed for the new job as well.

Illustrated at the left are three of the line of KENNAMETAL standard tool styles and the operations for which they are designed. Catalog 43B illustrates all standard and non-standard KENNAMETAL tool styles for boring, facing, and turning operations on steel.



Write for your copy of this catalog . . . it will help you choose the correct tool for any operation.



INVENTED AND MANUFACTURED IN U. S. A.



McKENNA METALS Co.

144 Lloyd Ave., Latrobe, Pa.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)

Steel Executives to Assemble in N. Y. May 27

New York

• • • Technical and industrial relations subjects of current significance were to feature addresses presented here May 27 at the fifty-second general meeting of the American Iron and Steel Institute. Highlighting the meeting were addresses scheduled to be made at the morning session by Walter S. Tower, Institute president, Vice Adm. S. M. Robinson, Office of Procurement and Materials, Navy Department, and Maj. Gen. L. H. Campbell, Jr., Chief of Ordnance, War Department.

The afternoon session is to be divided into two general sessions, one on technical subjects, the other on industrial relations. Technical and industrial relations papers prepared for the meeting include:

"Increasing Importance of the Bessemer Process," S. J. Creswell, superintendent, open hearth No. 3 and Bessemer department, South Chicago Works, Carnegie-Illinois Steel Corp.; "Effects of Temperature on Blooming Mill Production of Hot-Topped Steels," H. J. Forsyth, metallurgist, Republic Steel Corp.; "Increased Blast Furnace Capacity and How Accomplished," George T. Williams, superintendent, blast furnaces and coke plant, Indiana Harbor Works, and B. M. Stubblefield, superintendent, blast furnaces and coke plant, Campbell Works, Youngstown Sheet & Tube Co.; "Plant Production Problems Presented by Sustained High Level Operations," E. C. Wright, chief metallurgist, National Tube Co.; "Increase in Open Hearth Production and How Achieved," A. P. Miller, assistant general superintendent, Inland Steel Co.; "War Expansion Program of the Steel Industry"—General Statistical Review, J. A. Kinney, assistant to vice-president, Bethlehem Steel Co.; "Wartime Production of Constructional Steels in the Basic Electric Furnace," H. W. McQuaid, assistant chief metallurgist, Republic Steel Corp.; "The Wire Industry and the War Effort," J. S. Richards, research director, American Steel & Wire Co.; "Conservation of Critical Materials," C. H. Herty, Jr., assistant to vice-president, Bethlehem Steel Co.; "Production of Steel Plates," C. L. McGranahan, assistant general superintendent, Pittsburgh Works, Jones & Laughlin Steel Corp.; "Wartime Scrap Problems," F. E. Vigor, vice-president in charge of manufacturing and mining operations, American Rolling Mill Co.; "The Trend in Alloy Steels," John Mitchell, metallurgical engineer, Carnegie-Illinois Steel Corp.; "Evolution of Industrial Relations Between Two Wars," J. A. Stevens, vice-president, United States Steel Corp. of Delaware; "Designs for Future Industrial Relations in Steel," C. L. Huston, Jr., assistant to president, Lukens Steel Co.; "The Steel Industry and National Manpower," R. C. Cooper, assistant vice-president, Wheeling Steel Corp.

Absenteeism Up to 56 Per Cent

• • • The National Association of Manufacturers announced May 18 that as a result of an absenteeism survey in 25 of its member company war plants it had been established that the wartime average of absenteeism in those companies has increased 56 per cent since the war effort started.

ROEBLING Wires

ROUND . . . FLAT . . . SHAPED

A FEW WIRES TYPICAL
OF ROEBLING'S BROAD
SPECIALTY PRODUCTION

ROUND WIRES
TO SPECIFICATION

SHAPED WIRES

"Getting
the Drop"
WITH THE
RIGHT WIRES

FLAT WIRES FOR
AERIAL CAMERA PARTS



AN AERIAL CAMERA may not seem like a front line weapon—but with these precise instruments our Army Intelligence is really "getting the drop" on our enemies: spying out big gun emplace-

ments, ammunition depots, harbor facilities . . . and learning plenty about the enemy's dispositions *before* our bombers or troops move in for the kill.

Flat wire for aerial camera parts must meet tough specifications, for these eyes of the army have to operate perfectly and precisely at temperatures ranging from 110° at sea level down to -50° at high altitude! Roebling flat wire for optical parts is meeting such tough specifications *consistently* . . . providing a "special" in terms of temper, or dimensions, or steel quality that exactly fills the bill on a difficult job.

Is wire supply one of your war-production problems? Let Roebling help you "get the drop" on it with the skill, experience and facilities that have solved so many wire problems.



JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY

Branches and Warehouses in Principal Cities



X-ray makes possible the most efficient inspection technique for "seeing through" metals to detect flaws that cannot be revealed by surface examination.

KELEKET offers a complete line of X-ray equipment with the flexibility and power range to inspect all types of metal parts from 1/16 in. aluminum sheets up to armor-plate 4 in. thick.

There is no obligation when you consult KELEKET X-ray engineers for advice and recommendations on your specific problems and applications.

FOR LIGHT ALLOYS AND DIE CASTINGS KELEKET PROVIDES BETTER THAN 5% FLUOROSCOPIC SENSITIVITY



Producers of light alloy castings will be interested in KELEKET'S Fluoroscopic equipment. Except in the few cases requiring film records this apparatus meets all requirements for X-ray inspection. The savings resulting from the elimination of film and processing costs are substantial.

KELLEY-KOETT X-RAY MFG. COMPANY

2305 WEST FOURTH ST., COVINGTON, KY.

PIONEER CREATORS OF *Quality* X-RAY EQUIPMENT SINCE 1900

96—THE IRON AGE, May 27, 1943

Formula Which Will Cover Absenteeism Given in Bulletin

Washington

••• A briefing of the U. S. Department of Labor, Division of Labor Standards, special bulletin No. 12 (for sale by Supt. of Documents, U. S. Government Printing Office, Washington, D. C., price 10c.) entitled "Controlling Absenteeism" shows the following:

• **Definition**—"Absenteeism is the failure of workers to report on the job when they are scheduled to work. It is a broad term which is applied to time lost because sickness or accident prevents a worker from being on the job, as well as unauthorized time away from the job for other reasons. Workers who quit without notice are also counted as absentees until they are officially removed from the pay roll."

• **Extent**—Few figures are available and these are seldom comparable with figures for similar plants or industries. The Bureau of Labor Statistics has studied commercial shipyards and airframe plants.

• **Shipyards**—Absenteeism fluctuated around seven or eight per cent from April through October, 1942. Rates varied from yard to yard and area to area from two to over 20 per cent. This is the only industry for which comparable figures from the last war are available. Present absenteeism is less than half of what it was then.

• **Airframes**—Plants making airframes on the basis of January, 1943, figures have an average absentee rate of 6.4 per cent, varying widely by plant and area.

• **Other Industries**—About 36 per cent of firms giving the Division of Labor Standards their experience claimed little or no absenteeism problem. Middle Atlantic States and Southwest suffered least. Industry-wide, utilities, and oil companies suffered least.

• **Normal Absenteeism**—No one knows what it is or should be. Some estimates place it as two or three per cent. Some companies with a three per cent rate have set up programs to curtail it. Others with five or six per cent think it is normal and nothing to worry about at the present time.

• **Causes**—Most frequently cited;

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CAREFUL finishing
IN OUR PLANT
GIVES YOUR
PRODUCTION
A good start

Uniformity of thermal treatment and dependable quality in all finishing operations, are essential in the making of a steel that will flow smoothly and rapidly through your production machinery.

The modern and extensive Aristoloy finishing facilities, are completely integrated and assembled in our Warren plant. This centralized manufacture results in undivided quality responsibility through each steel-making step from melting to finishing.

COMPLETE MODERN FACILITIES FOR
annealing and heat treating
rough-turning • centerless grinding
turning and polishing • cold drawing

**ARISTOLOY
STEELS**

- CARBON TOOL STEELS
- ALLOY TOOL STEELS
- AIRCRAFT QUALITY STEELS
- BEARING QUALITY STEELS
- STAINLESS STEELS • NITRALLOY STEELS

COPPERWELD STEEL COMPANY WARREN, OHIO

Why Salt Baths are THE LOGICAL WAY TO HARDEN

WITHOUT DECARB OR SCALE ✓
WITH MINIMUM DISTORTION ✓
AT FASTEST HEATING RATE ✓

CARBON AND ALLOY STEEL PARTS



An Ajax-Hultgren furnace is the *logical* way to harden, because:

1. In hardening, a neutral molten bath "controls the atmosphere" by the simple process of eliminating it entirely. A salt film seals out deleterious gases right up to the instant of quenching, hence decarburization, oxidization, or scaling *cannot* occur. No other heating medium possesses this valuable characteristic.
2. A salt bath is the fastest heating medium for transferring heat to work. Therefore, an Ajax furnace will yield more completed heating cycles per day than any radiation or forced convection system.
3. Heating in an Ajax-Hultgren furnace is uniform at all points, hence distortion does not occur. This feature—based upon absolute and automatic temperature control—is an inherent characteristic of the furnace, and no other means will provide such temperature control and uniformity of heating within such narrow limits (5 deg. F. or less).
4. All forms of hardening in an Ajax-Hultgren furnace may be done selectively, as desired. This feature itself is only a partial demonstration of the great flexibility of these units as used in industry today.

It is only logical to find that there are now more than a thousand Ajax-Hultgren Electric Salt Bath Furnaces in use* for . . . hardening armor plate, armor piercing shot, dies . . . aircraft structures, steering gear assemblies, ordnance components, gears, high speed steel tools (up to 2400 deg. F.), etc.

If you have not yet investigated Ajax-Hultgren applications, send at once for Catalog 107-A. It describes manual and mechanized installations, from 35 to 750 kilowatts in size.

AJAX ELECTRIC COMPANY, INC. 900 FRANKFORD AVE. AT DELAWARE AVE., PHILADELPHIA, PA.

Immersed in the salt bath 1550 deg. F. and quenched over a mandril in oil, cylinder sleeves shown diameters to .007" at speeds of 120 in 8 hours, in the 65 kilowatt Ajax-Hultgren furnace illustrated above.

HERE ARE THE NEW PROCESSES TODAY...

- CARBURIZING
- SIMULTANEOUS BRAZING & CARBURIZING
- NEUTRAL HARDENING
- CYANIDE HARDENING
- SELECTIVE HEATING
- AGE HARDENING
- TEMPERING
- HARDENING HIGH SPEED STEEL TOOLS
- ANNEALING
- BRAZING
- HEATING FOR FORGING

*THERE'S AN AJAX-HULTGREN INSTALLATION NEAR YOU



THE **AJAX** ELECTRIC SALT BATH FURNACE HULTGREN

ASSOCIATE
COMPANIES:

AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORPORATION, Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC FURNACE CORPORATION, Ajax-Wyatt Induction Furnaces for Melting
AJAX ENGINEERING CORPORATION, Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

Fontana's Steel Not First Made on Coast

••• Excited about the opening of the new Kaiser steel plant, the Southern California editor wrote a headline in the last issue which said the Fontana mill had poured the first steel ever made on the West Coast. Without detracting from the Kaiser achievement, it is only fair to point out that steel long has been made on the West Coast. One unit of Bethlehem Steel Co. started making steel in 1905, while Columbia Steel's plant started making steel in 1910, according to an informed source.

personal illness, transportation difficulties, high wages, long hours, bad nutrition, lack of child care, illness in family, wives visiting husbands in camp, and bad weather.

• **Methods of checking**—They vary from company to company. Some have elaborate records, others nothing except pay roll records of time worked. Dept. of Labor recommends in the smaller plants or where plant accounting and research facilities are unavailable a simple count of unpunched time cards. These will show the number of employees absent by plant, department, shift, day and usually sex. These offer minimum data for purpose of analysis. For purpose of control, more records must be kept by tabulating data on the unpunched cards on individual employee record cards. Spot studies, if properly made, may give sufficient information for purpose of analysis. For control, best check on cause is to secure it from interviews with returning absentees. Definite rules should be set up on excused absences so as to find out how much is "AWOL." Vacations, holidays, military leaves, etc. should not be included in absenteeism figures.

• **Formula**—In order to have a common and comparable basis for measuring absenteeism in various plants, the Bureau of Labor Statistics suggests the following formula:

Absenteeism =

Man days lost

Man days worked plus man days lost

Upp and Adam

by Mason & Hahn



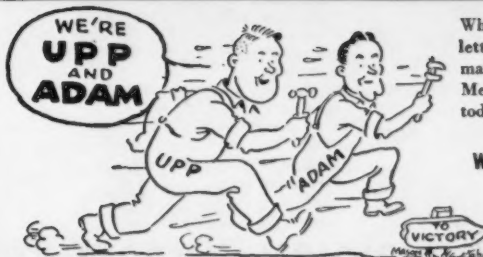
If all the Eureka Tool Steel and Alloy Welding Electrodes that have been used on defense work for the conservation and reclamation of tools, dies, etc., were strung end to end, there would be more than enough to string up Hitler, Mussolini and Hirohito. You may be interested in knowing how you can bring about this accomplishment—if so write or wire us at once.

★ Send for our Eureka Tool Steel Electrode Catalog and Procedure Manual. ★

WELDING EQUIPMENT & SUPPLY CO.

230 LEIB STREET

DETROIT, MICHIGAN



Why not be Upp and Adam too—by letting us outline your tool and die reclamation program with Eureka Electrodes. Merely fill out the coupon below and send today.

Welding Equipment & Supply Company
230 Leib Street
Detroit, Michigan

Gentlemen: Please send me complete information on Eureka Electrodes.

Name..... Title.....

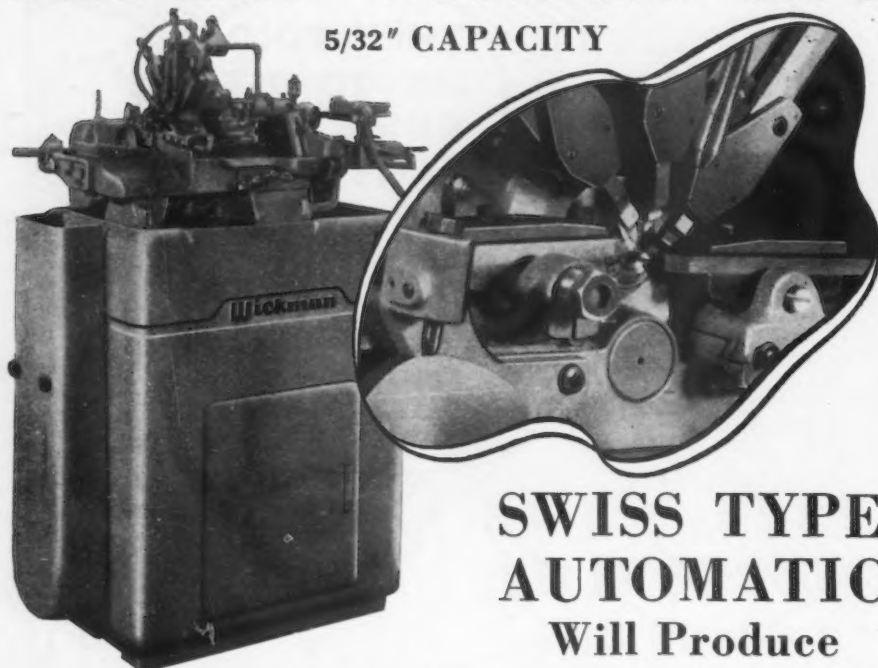
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THE NEW WICKMAN No. 1

5/32" CAPACITY



SWISS TYPE AUTOMATIC Will Produce

Amazingly Accurate Small Parts Such

The parts shown greatly enlarged at the right were produced in one operation by the new Wickman No. 1 High Precision Swiss-type Automatic. This new machine employs five cam actuated radial tools and a cam controlled sliding headstock that feeds the bar stock past the tools.

By a combination of tool and headstock movements any form can be generated by single point tools having both lateral and radial micrometer adjustments. Limits of $\pm .0002$ and better can be held on production work. Write today for complete information.

AS THESE



PART-1/8" LONG, 6 diameters, 2 tapers, 2 pivots between .004" and .050". Finished ready for burnishing.

MATERIAL—High carbon pinion steel.
PRODUCTION—80 per hour.

TOLERANCE— $\pm .00015$ ".
FINISH—15 to 20 Micro-inches.

PART-7/16" LONG, 6 diameters, 1 pivot, 2 undercuts and thread between .027" and .041". Finished complete.

MATERIAL—High carbon pinion steel.

PRODUCTION—120 per hour.

TOLERANCE—turned $\pm .0002$ ", thread P.D. $\pm .001$ ".

FINISH—15 to 25 Micro-inches.



WICKMAN HIGH PRECISION AUTOMATIC SWISS TYPE

THE Wickman
CORPORATION

15537 WOODROW WILSON
DETROIT, MICHIGAN

NEWS OF INDUSTRY

Net Profits Gain After Renegotiation

Pittsburgh

••• Renegotiation of contracts is the war-time substitute for competition, according to Maurice Karker, chairman, Army Price Adjustment Board, who, with other governmental agencies, attended a conference of all PAB's here last week.

It was said that many times the fear of what's going to happen as a result of renegotiation is tougher than the process itself.

According to government officials attending the meeting, a total net profit of 148 companies after taxes and renegotiation in 1942 was 9.4 per cent more than in the so-called normal period of 1936-1939.

The various price adjustment boards claim more interest in the saving through price reduction than they do in cash refunds. They say lower prices are a greater benefit to the greatest number of people involved.

War Department renegotiations to date disclose savings of about 30 per cent in cash and about 70 per cent in price adjustment, it was said. It was also stated that on refunds through renegotiation the government gains about 33 1/3 per cent more than would be the case under excess profit taxes alone.

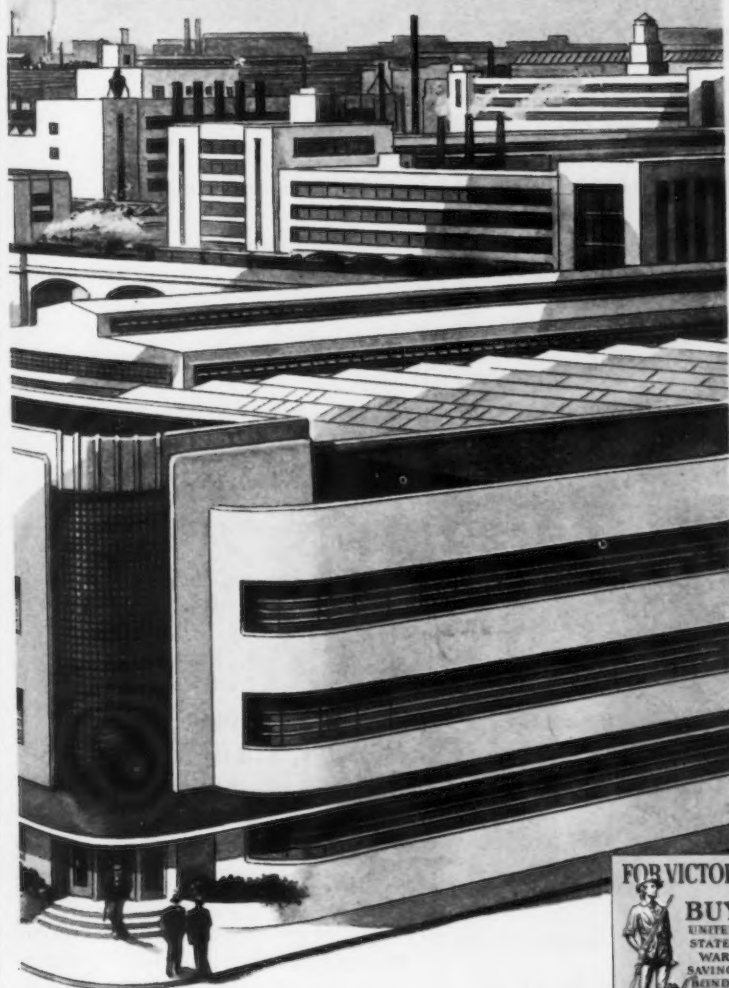
About 25,000 companies must be renegotiated this year for their 1942 experience. The War Department has been assigned 10,000 cases, Mr. Karker said, of which about 15 per cent are completed. He made a plea for industry to furnish as much personnel as possible so that renegotiations would be handled by those best qualified for the job.

Could Be—



Know the Name

BOHN



Headquarters—

THIS organization is one of America's foremost designers and fabricators of aluminum, magnesium and brass products and aircraft-type bearings.

The advanced engineering achievements and vast resources of Bohn have made possible many non-ferrous alloy basic developments of great importance.

The whole chain of Bohn plants is now working night and day on war materials and will be, for the duration.

Because of the vital production and precision requirements for war materials, Bohn research and metallurgical studies have made possible many new applications for modern light alloys, which will be highly useful in industrial America of tomorrow.

Many leading manufacturers consider Bohn, headquarters for aluminum, magnesium and brass products. Business consults Bohn because of the far-reaching experience this organization has had in its highly specialized field.

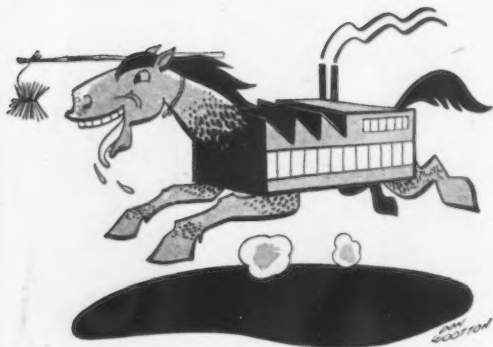
Remember the name Bohn. Some day, Bohn may be of assistance in helping plan your new products for a new era.

BOHN ALUMINUM AND BRASS CORPORATION, Detroit, Michigan

Designers and Fabricators

ALUMINUM • MAGNESIUM • BRASS
AIRCRAFT-TYPE BEARINGS





WHY INCENTIVES?

Labor wants incentives to make more money.

Management wants incentives to increase production.

Incentives will not take the place of good management. That would be getting the cart before the horse, for "labor is just as efficient as management plans for it and provides the tools with which to work."

Therefore, before initiating an incentive program management must assume certain responsibilities in order that the results required of incentives will be forthcoming. Some of these are: good material control, good production control, good tool control.

Then and only then, can manufacturing operations be analyzed to determine the most suitable type of incentive and the most desirable method of putting it into effect.

A lack of experience in (1) determining the most practical incentives and (2) in installing them, has been the cause of many unsuccessful installations and caused the loss of benefits which might otherwise have been obtained.

Having served many clients in handling problems such as these, Trundle Engineers are in a position to be helpful from both the management and labor point of view.

Geo. W. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

GENERAL OFFICES • CLEVELAND • BULKLEY BLDG.
CHICAGO • City National Bank Bldg. • 208 S. La Salle Street
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Demobilization to Create Staggering Employment Problem

New York

• • • Demobilization will create an employment problem greater in magnitude than the task of finding jobs for all men employed in manufacturing in 1939, according to the division of industrial economics of the National Industrial Conference Board. This fact, the board says, emerges from its survey of the economic background for postwar reconstruction in preparation for its twenty-seventh annual meeting held at the Waldorf May 26.

By the end of this year, the board continues, the armed forces will exceed by 4.5 million the number of male wage earners in manufacturing in peacetime.

More civilians have been added to public payrolls since February, 1941 than have been added to any other single industrial field. This total increase, at slightly below two million, including those at work in arsenals and other government plants, exceeds the combined number added in shipbuilding, aviation, and other transportation equipment.

By the close of this year nearly 17.5 million individuals will derive their livelihood from government. There will then be only two workers in private industry, excluding agriculture, for every person in the armed services or in civilian government employment.

Roughly 62.5 million men and women will be at work or in the armed services. Total employment will then exceed by about 6.5 million the normal labor force of the nation in peacetime. Yet the number at work in private industry will be as low as at the outbreak of the war.

Steel Warehouse Prices for N. J., N. Y. Listed in Bulletin

• • • A handy compilation of delivered prices of warehouse steel products in Zone 2 under Price Schedule 49 has been prepared by Fairbairn Iron & Steel Co., Inc., Newark, N. J.

Prices for about 150 cities in New Jersey and about the same number of communities in New York State are listed in the eight-page mimeographed bulletin, which also includes quantity differentials.

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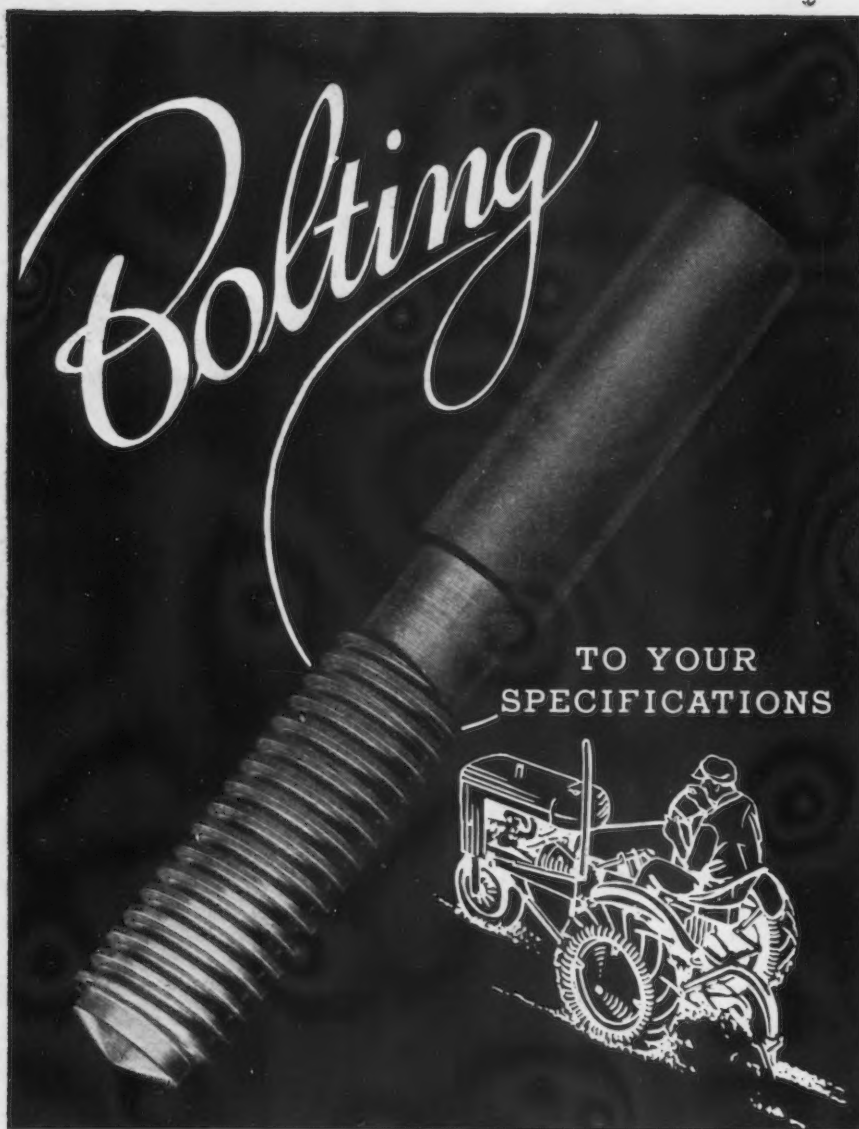


You can't ask a gunner to watch his step

Uncle Sam braces gun crews for battle on "A.W." Rolled Steel Floor Plate. Guards against dangerous slipping and falling accidents. "A.W." Floor Plate protects men essential in the war effort wherever they may be—in war production plants, refineries, power plants; in tanks, troop-carrying trucks and on shipboard. Toughest wear will not damage or impair it. Ends floor troubles for good. Write for folder.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS: CONSHOHOCKEN, PENNSYLVANIA : SINCE 1826. District Offices and Representatives: Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, St. Paul, New Orleans, Pittsburgh, Roanoke, Sanford, N. C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal



More Food—More Tractors and More of These Special Studs

This special Erie Acme Threaded Steering Gear Stud for a well known tractor may soon be ordered again into service in answer to the tremendous need for more equipment for food production.

A review of orders for Erie's Special Bolts, Nuts and Studs reflects the importance that Uncle Sam is placing on all war materiel for specialized bolting is a vital part of fighting machines and of machines for producing fighting machines.



Warehouse Stocks on Upswing, Annual Convention Learning

New York

• • • Showing exceptional interest in current problems which center principally around WPB and OPA regulations, members of the American Steel Warehouse Association, Inc., turned out in force for their 34th annual meeting May 26 at the Plaza here.

Walter S. Doxsey, president, in his speech before the convention, pointed out that since the establishment of the Steel Recovery Corp. last August, some warehouses have fared well under the program while many have not secured a pound of steel from idle inventories. He urged, however, that the program should not be appraised by individual success or failure to get some of the frozen steel for warehouse stocks. The formation of the Army's warehouse in Rochester, N. Y., last May caused warehousemen to fear that it might point the way to widespread usurpation of their functions and business by federal or military agencies, he added. The failure of this activity, he continued, should stand forth as an example for a long time, should anyone else get a similar idea.

In 1942 when steel was flowing out of warehouses faster than replenishments were being delivered inventories dropped at alarming rates, said the speaker. The turn came in the Fall and by Dec. 31, 1942, warehouse inventories had recovered to 90.6 per cent of the December, 1941, level. They continued to rise, he said, during the first quarter of 1943, and by the end of March stocks on hand were 122.1 per cent of December, 1941, inventories, and are still on the upswing. Also, in the opinion of the speaker, relaxation in the number and extent of limitation orders might readily be employed to keep demand in pace with production.

Lt. Col. J. P. Woodlock, commenting that the war has taxed the ingenuity of the steel industry, brought out the following events. "In recent months a tight situation has arisen in the supply of molybdenum. This problem is being partially alleviated by the increased use of "intensifying" or "needling" elements such as boron. The development of these steel addition agents off-set shortages created by the unprecedented demands for the common alloying metals and represents a noteworthy contribution by American metallurgists. This Spring

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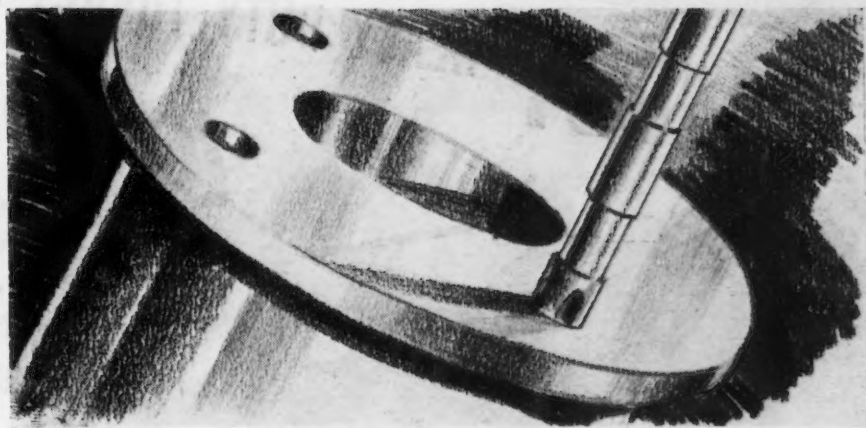
became apparent that the demands of columbium for use in stainless steel were in excess of the available supply and a shift is now taking place to titanium. Manganese is playing an increasingly important role by replacing nickel, chromium and molybdenum in high tensile steels in certain applications."

The major expansion in both mining and reduction facilities for the more important alloys available from North and South American resources, he said, have either recently been completed or will be in the near future. This additional quantity of ferro-alloys combined with a better use of all the alloying metals provides a justifiable basis for an optimistic viewpoint on our future supply.

Along with NE steels, said the speaker, a new, low-alloy rolled and cast armor which is used in tanks, bombers and fighter planes has been developed and brought into large scale production by the joint efforts of the steel industry and the Army.

The steel recovery program is just now approaching its peak, said A. Bram Fulton, in his address. "We expect this to be reached very shortly and then continue at top level for several months, after which it will gradually diminish," he said. "After all, this is what might be termed a 'one shot' operation. Once we have collected all of the idle and excess steel now existing and channeled it into war uses the job will be finished. In other words, we hope we are not creating new idle and excess material. Of course, there will always be some recurrence of idle and excess steel, due to cancellations, cut-backs and changes in design. However, under CMP the tonnage involved should be very small because manufacturers do not receive their steel earlier than 15 days preceding the month in which it is required. Also, should cancellations or cut-backs occur, the Claimant Agencies involved certainly will know the steel on hand in a given manufacturer's plant at the time. Thus, any steel becoming idle or excess will be definitely known and under control.

"It is estimated that since Pearl Harbor up to the end of Steel Recovery Corp. operations, in the vicinity of 4,000,000 tons of idle and excess steel will have been moved from the plants and put into war channels. What is not so well known is that approximately 85 per cent of this steel has been redistributed and our present estimate of the amount of idle and excess steel is that there does not exist in the country over 600,000 tons.



How Cleaner Castings *Increase Tool Life* and Improve Inspection



AIRLESS WHEELABRATOR abrasive blasting leaves metal products lustrous and perfectly clean, because it scours every trace of sand and scale away from the base metal.

Results: Machining and grinding are speeded up, tool life is greatly prolonged, inspection is simplified.

Example: Bronze Alloys Co. of St. Louis replaced their wet tumbling process with a 20" x 27" Wheelabrator Tumblast for cleaning bronze and aluminum castings. The improvement in tool life in machining Wheelabrated castings was quickly noted by their customers, with the result that a Wheelabrated finish is now specified on practically all casting orders received.

Of equal importance was the fact that the Wheelabrator cleaned out cracks and fissures which previously had not been visible on inspection. Unfortunately such defects were not discovered until subsequent machining operations. Now, imperfections are revealed before the castings leave the foundry, and it is seldom that a Wheelabrated casting from Bronze Alloys is rejected as imperfect by a customer.

The full story about these and other profitable advantages of the Wheelabrator are yours for the asking. Why not write us about them today?



*World's Largest Builders of
Airless Blast Equipment*

AMERICAN
FOUNDRY EQUIPMENT CO.

510 S. BYRKIT ST., MISHAWAKA, IND.

LIBBY HEAVY DUTY TURRET LATHE PERFORMS 10 Operations

ON SOLID STEEL FORGING
... including
BORING, REAMING, TURNING,
SPOT-FACING, CHAMFERING, AND THREADING



● On this airplane landing strut, machined from a solid steel forging, a Libby Heavy Duty Turret Lathe performs a variety of ten operations in a total time of 2½ hours, floor-to-floor. Four boring operations are performed on holes up to 6.345" x

6" deep with cemented carbide tools. Subsequent operations include; reaming a 3⅛" diameter, spot-facing shoulder, and, on the cross slide, turning O.D. for thread, threading relief on O.D., chamfering both edges, and threading the inside.

This installation is typical of the way Libby Heavy Duty Lathes are being used for a wide variety of heavy duty work as well as the regular run of turret lathe work. If your turret lathe work is large or unwieldy, consult our engineers for their recommendations—there is no obligation.

FREE BOOKLET

This booklet contains additional information concerning other valuable features of the Libby Heavy Duty Turret Lathes...write to Libby Division, 1136 W. 21st Street, Indianapolis, Indiana.



JOB DATA

MACHINE—Libby 4H Heavy Duty Turret Lathe.
PART—Airplane Landing Strut.
MATERIAL—Solid Steel Forging.
HOLDING METHOD—3-Jaw Chuck—Steady Rest.
FLOOR-TO-FLOOR TIME—2½ Hours.

OPERATIONS:

- 1st—Bore 6.345" x 6" deep, -.005" +.000" on diameter.
- 2nd—Bore 5.970" x 25" deep, -.005" +.000" on diameter.
- 3rd—Bore 3 sizes, 3⅛" dia., 5.970", 6.244" thread diameter.
- 4th—Finish bore 3⅛" dia., 5.970", 6.244" thread diameter.
- 5th—Ream 3⅛" diameter, 27" from end.
- 6th—Spot-face shoulder 25⅛" deep from end, without support.

CROSS SLIDE OPERATIONS:

- 1—Turn O.D. for thread.
- 2—Thread relief on O.D.
- 3—Chamfer both edges.
- 4—Thread inside, 16 pitch.

INTERNATIONAL MACHINE TOOL CORPORATION

LIBBY DIVISION, INDIANAPOLIS, INDIANA • FOSTER DIVISION, ELKHART, INDIANA

MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS
SUPERFINISHING MACHINES • BARKER CHUCKS • UNIVERSAL RAM TYPE TURRET LATHES

Master CMP Sheet Is Recommended to Purchasing Agents

New York

• • • Use of a "master sheet" to control purchase orders for controlled materials which are placed for future delivery up to quantities allotted was recommended by Harold V. Chisholm, purchasing agent, Walworth Co., Boston, at the convention of the National Association of Purchasing Agents held here May 24-26 at the Waldorf-Astoria. Mr. Chisholm discussed "How a 'B' Products Producer Operates Under CMP."

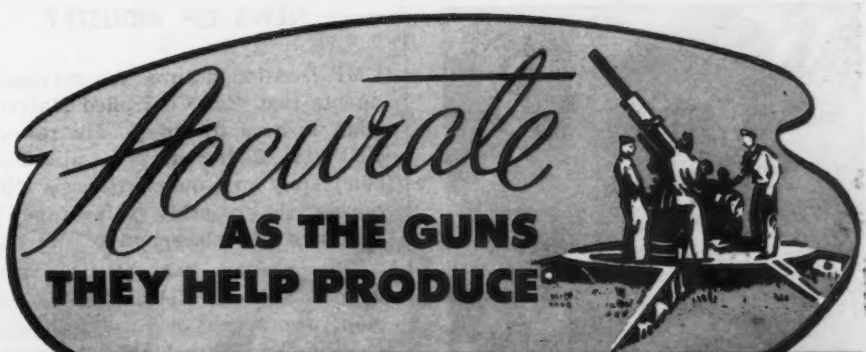
"Such a master sheet will indicate at a glance the inventory position of each item—the quantities on order—the quantities required each month, and the vendor's shipping schedule," he said. "When placing purchase orders from 9 to 12 months in advance—with such a master sheet as a guide—we are better able to review the picture each month. We find use of the CMP monthly designation as a suffix to our purchase order is helpful in checking the scheduled delivery of numerous orders."

"For the control of receipts, we have found that a visible index type of card set up for each classification of controlled products with the total allotment on each card is very satisfactory. The receiving department should be instructed to warn the purchasing department when allotments have been approximately 90 per cent applied—to permit the purchasing department to stop further shipments not already in transit or obtain additional authorization," Mr. Chisholm said.

Among speakers presenting specific features of the CMP and its applications, W. Z. Betts, director, Division of Purchase and Contract, State of North Carolina, spoke on "MRO: How a Governmental Agency or Institution Operates Under Regulation No. 5A."

Stressing that the quantity limitations in CMP Regulation No. 5 should be regarded as "maximum rather than as the best quantity to purchase," William E. Arnstein of the CMP Division, WPB Regional Office, New York, stated that "abuse of the privileges in Regulation No. 5, though legal, may and probably will result in a request from the conscientious manufacturers that the government protect them by revising the regulation in terms of added reporting features, controls and restrictions."

Walter C. Skuce, director of the



INDEX MILLS

Manufactured by Index Machine and Tool Co., Jackson, Michigan.

CHECK THESE FEATURES!

★ Precision Ball Bearing Spindle that will require no attention for two years.

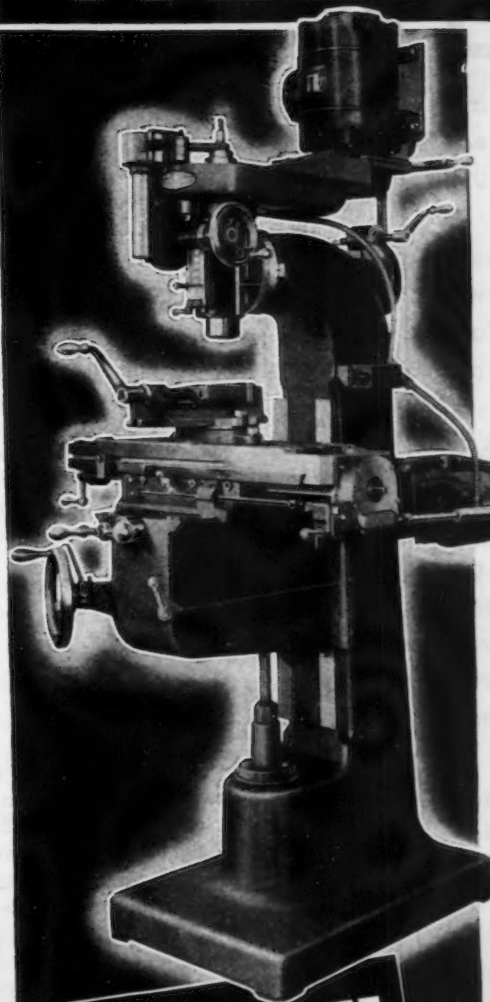
★ Swivel Head which can be set 90° right or left.

★ Super construction sensitive enough to do work with end mills $\frac{1}{8}$ " diameter yet rugged enough to use $\frac{3}{4}$ " end mills taking full cuts 24 hours a day.

★ Verniers for locating, and power feed to spindle for boring.

★ A versatile machine that can be used in the tool room or on the production line.

Send inquiries for immediate quotation and quick delivery to Factory Sales and Distributing Agents.



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and
BUXTON
MACHINERY**

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JACKSON, MICHIGAN



The Young Men Know Their Engines

American built planes are carrying on along the Mediterranean and in the South Pacific.

Skillful American Pilots, serviced by skilled ground crews, are steadily shoving the Nazi and the Jap back to defeat.

These young Americans are living up to the tradition that made this country prosperous and great.

Fenn precision built parts go into the construction of many planes, ships, tanks — wherever the demand is for special machinery and parts made to accurate measurements.

Fenn acts as prime contractor or sub-contractor on special machinery, parts and equipment. We welcome inquiries from those who need assistance in either developmental work or actual production.



CMP Division, assured the purchasing agents that "the Controlled Materials Plan is here to stay." He revealed that it is planned to place allotments completely on a quarterly basis eliminating the monthly percentage restrictions for placement of orders.

Among other convention speakers were Donald M. Nelson, WPB chairman, whose subject was "Production Is Winning Battles on All Fronts," and Arthur D. Whiteside, WPB vice-chairman for civilian requirements and president of Dun & Bradstreet, New York.

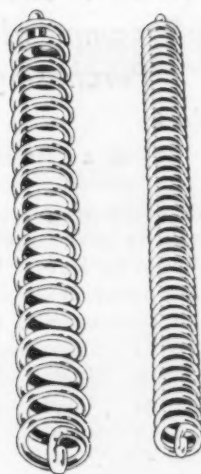
Employment Reaches New Peak Conference Board Learns New York

••• At the annual meeting of the National Industrial Conference Board held at the Waldorf Astoria Hotel, May 26, it was revealed that employment in March reached a record high of 59.7 million, nearly a million above the preceding month. Eight million more in all were at work or in uniform than a year ago. Nearly half a million workers were added on the farm front in the month, but the total remained about 100,000 below the level of a year ago.

Aluminum production in 1942 was increased to 461,000 short tons, and the rate of production at the end of 1943 should exceed a million short tons, according to the Board's figures. The Board estimated that production of copper in 1942 was 1,100,000 short tons. Ultimate wartime capacity of magnesium is expected to be between 600 and 700 million pounds.

Lend-Lease Steel Exports Set at 6,500,000 Gross Tons

••• Passed by the House last Friday, the lend-lease supplemental appropriation bill carrying \$6,273,629,000 with \$2,057,496,000 uncommitted for the year ending June 30, 1944, provides \$713,255,097 for the purchase and exportation of 6,500,000 gross tons of iron and steel. Non-ferrous metal purchases will aggregate \$392,000,000, representing 500,000 tons. The great bulk of the non-ferrous purchases will be copper and brass for which an appropriation of \$200,472,775 was made. Appropriations of other principal non-ferrous materials include aluminum, \$81,759,551; zinc, \$18,505,100; lead \$1,067,100; other metals and alloys, \$73,031,943. Appropriations for machinery and equipment amount to \$504,000,000.

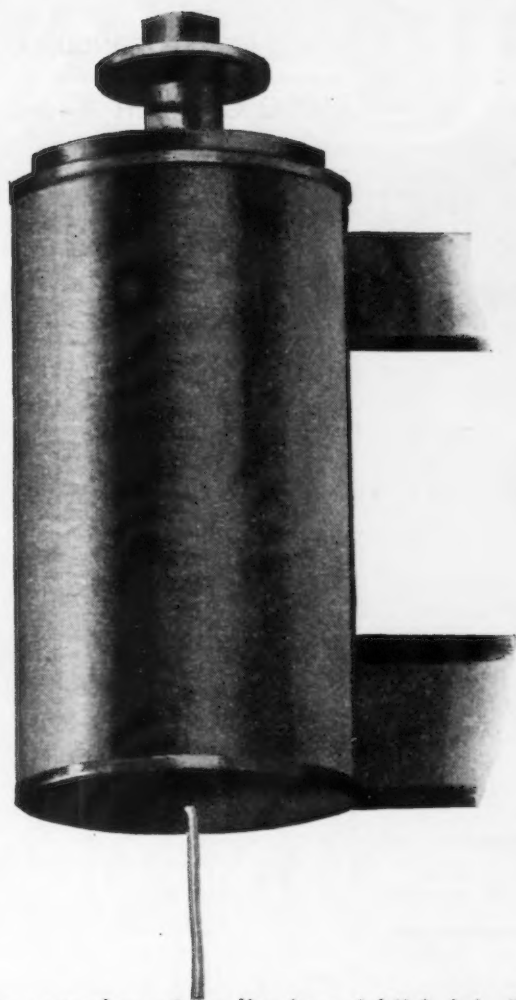


Beryllium Copper ... for springs

● Relatively new, this material is just what the Doctor ordered for certain specialized spring applications. Able to store up as much energy as an equal amount of steel, it possesses good electrical conductivity and resistance to corrosion. We know how to form and heat treat Beryllium Copper to bring out its best qualities.

*Write, wire or better still
... phone us.*

**AMERICAN
SPRING OF
HOLLY, INC.
HOLLY, MICHIGAN**



Danger! **CORDITE**

—and how Hele-Shaw Fluid Power Engineers tamed it

The extrusion of cordite is a ticklish job. Every conceivable precaution must be exercised to protect life and property.

Our engineers were asked to cooperate. Because of the safety factors there were many complications.

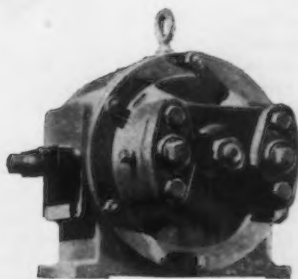
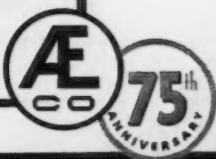
It was desirable, for example, to bring the ram down to the plug quickly to avoid wasting time. However, once the ram neared the cordite plug it had to stop, proceed automatically, and contact the plug without shock. There was still another condition. Once contact had been made, speed of extrusion and pressure had to be automatically con-

trolled, depending on the consistency of the plug.

After conferences with the manufacturer, we designed and furnished the entire pumping unit and oil circuit, including Hele-Shaw Fluid Power pumps and special controls.

Your post-war thinking may lack the drama of a cordite extruder, but offer equally baffling problems in improving a product or process, or in simplifying control or operation of a machine. If you have an idea Hele-Shaw Fluid Power or Hele-Shaw engineers can help you in your post-war planning, you are invited to write for further assistance.

THE
Hele-Shaw
Fluid Power Pump



OTHER A-E-CO PRODUCTS: TAYLOR STOKERS,
MARINE DECK AUXILIARIES, LO-HED HOISTS

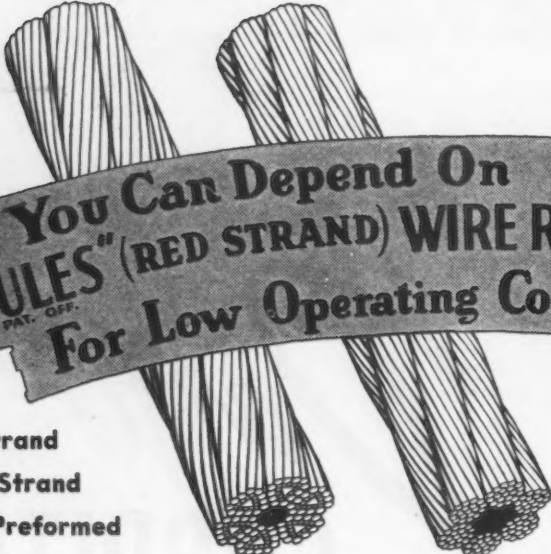
AMERICAN ENGINEERING COMPANY

2410 ARAMINGO AVENUE • PHILADELPHIA, PA.

**You Can Depend On
"HERCULES" (RED STRAND) WIRE ROPE
For Low Operating Cost**

REG. U.S. PAT. OFF.

**Round Strand
Flattened Strand
Standard & Preformed**



WHY not let "HERCULES" (Red-Strand) Wire Rope help you meet present day production requirements and still maintain a reasonable margin of profit? You will quickly discover that "HERCULES" is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production.

Made Only By **A. LESCHEN & SONS ROPE CO.** Established 1857
5909 Kennerly Avenue, St. Louis, Mo.
New York • Chicago • Denver • San Francisco • Seattle • Portland

CUTS the Toughest Steels and Largest Sizes easily

This giant hydraulic metal-cutting saw is more than just a larger hack saw. It is a new development in metal-cutting methods that introduces a new principle of metal sawing — the Roll-stroke blade action makes it possible to cut the toughest steels in the largest sizes easily and rapidly. It also permits a simple and efficient, very low pressure Hydraulic Feed System.

Built for heavy work, completely enclosed in heavy housing, this machine will stand up under the rough usage of the average steel mill warehouse and forge shop, where it will speed cutting-off, and reduce material loss.

Write for
Catalog

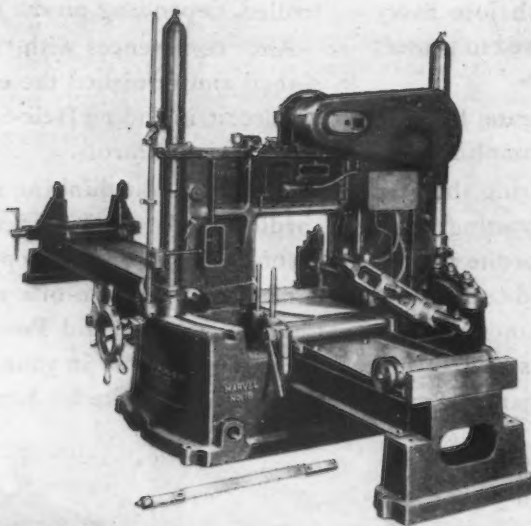
MARVEL SAWS

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.

MARVEL No. 18 Giant Hydraulic Hack Saw

Capacity 18"x18"

Cuts angles up to 45°
by simply swiveling upper machine housing.



Eastern Sales Office
225 Lafayette St.,
New York

NEWS OF INDUSTRY

DPC Contracts Awarded to Goodyear Aircraft, Others Washington

• • • Defense Plant Corp., RFC subsidiary, has authorized the following contracts:

Goodyear Aircraft Corp., Akron, Ohio, to provide additional plant facilities in Ohio, at a cost in excess of \$300,000, making a total commitment of more than \$8,700,000.

General Motors Corp., Detroit, to provide additional plant facilities in Michigan, at a cost in excess of \$1,125,000, making a total commitment of \$3,000,000.

Pittsburgh Equitable Meter Co., Pittsburgh, to provide additional equipment for a plant in Pennsylvania at a cost in excess of \$300,000, making a total commitment of more than \$440,000.

Aerogel Engineering Corp., Pasadena, Cal., to provide additional plant facilities in California at a cost in excess of \$100,000, making a total commitment of more than \$250,000.

National Cylinder Gas Co., Chicago, to provide additional plant facilities in Georgia at a cost in excess of \$60,000, making a total commitment of more than \$150,000.

P. R. Mallory & Co., Inc., Indianapolis, Ind., to provide for expansion of a plant in Indiana at a cost in excess of \$1,500,000, making a total commitment of more than \$2,500,000.

General Railway Signal Co., Rochester, N. Y., to provide equipment for a plant in New York at a cost in excess of \$2,100,000.

Deere & Co., Moline, Ill., to provide additional plant facilities in Illinois at a cost in excess of \$500,000, making a total commitment of more than \$1,125,000.

Addressograph-Multigraph Corp., Cleveland, to provide additional equipment for a plant in Ohio at a cost in excess of \$150,000, making a total commitment of more than \$550,000.

Doyle Machine & Tool Corp., Syracuse, N. Y., to provide equipment for a plant in New York at a cost in excess of \$200,000.

Issuance of a letter of intent to Brewster Aeronautical Corp., New York, to provide for the purchase of machinery and equipment for a plant in New York at a cost of approximately \$625,000.

Contract with National Pneumatic Co., Rahway, N. J., to provide equipment for a plant in New Jersey at a cost of approximately \$350,000.

Contract with Raytheon Production Corp., Newton, Mass., to provide plant facilities in Massachusetts at a cost of approximately \$90,000.

Extruded Metals Defense Corp., Belding, Mich., to provide additional plant facilities in Michigan at a cost in excess of \$1,000,000, making a total commitment of more than \$7,800,000.

The Transportation Commission, Seattle, to provide additional facilities in Washington at a cost in excess of \$325,000, making a total commitment of more than \$875,000.

Aluminum Co. of America, Pittsburgh, to provide additional equipment for a plant in Tennessee at a cost in excess of \$160,000.

Carolina Aluminum Co., Badin, N. C., to provide additional equipment for a plant in North Carolina, at a cost in excess of \$160,000.

Asbestos Mfg. Co., Huntington, Ind., to provide facilities for a plant in Indiana at a cost in excess of \$100,000.

Colorado Fuel & Iron Corp., Denver, to provide plant facilities in Colorado at a cost in excess of \$5,500,000.

Sylvania Electric Products, Inc., Exeter, Pa., to provide additional facilities for three plants in Pennsylvania at a cost in excess of \$360,000, making a total commitment of more than \$600,000.

Plant facilities in Pennsylvania at a cost in excess of \$350,000.

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FORGING PRESSES

WITH
SOLID STEEL FRAMES

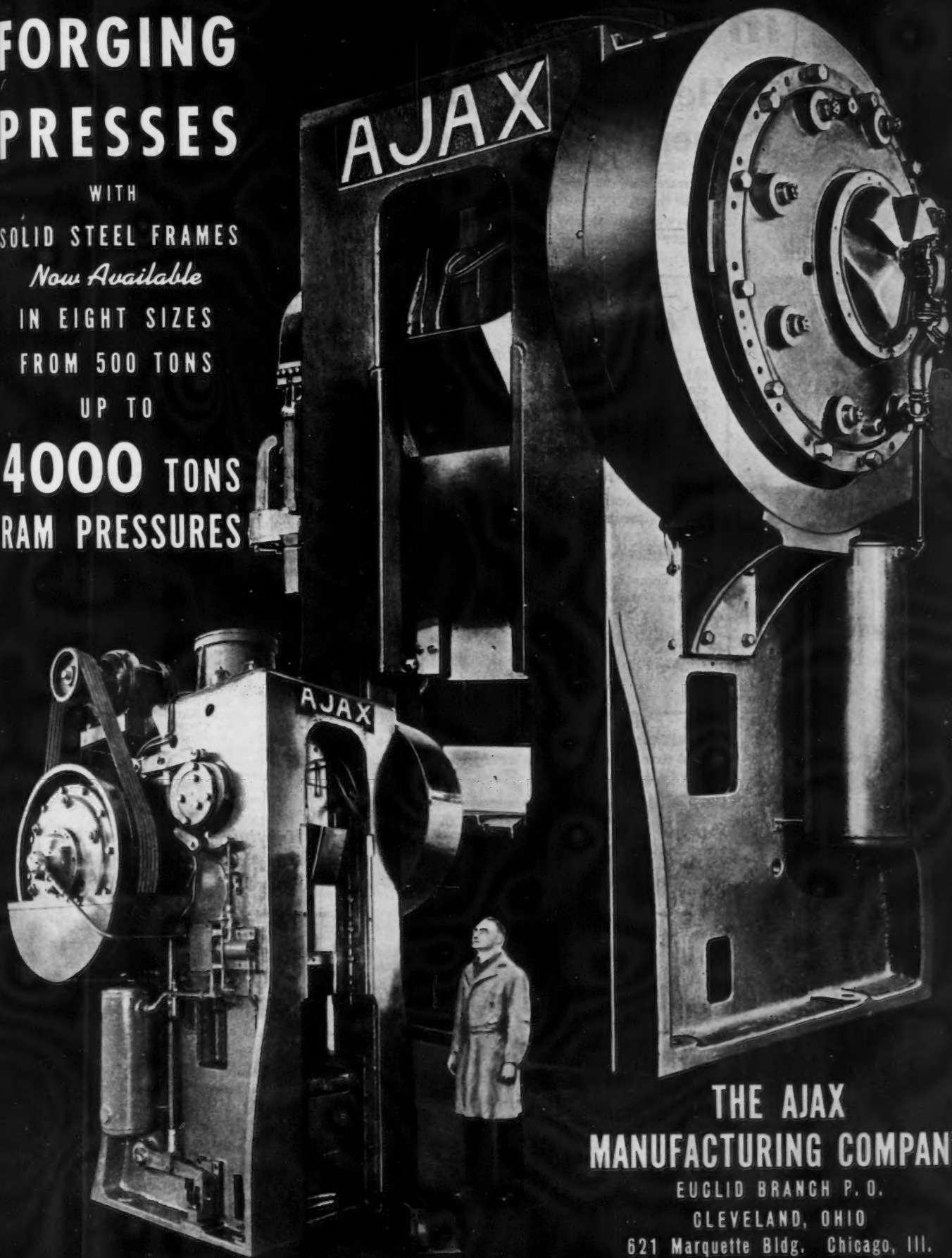
Now Available

IN EIGHT SIZES

FROM 500 TONS

UP TO

4000 TONS
RAM PRESSURES



**THE AJAX
MANUFACTURING COMPANY**

EUCLID BRANCH P. O.

CLEVELAND, OHIO

621 Marquette Bldg. Chicago, Ill.

Need Gauges in a Hurry?

Here is how to order them for Fast Delivery

To insure fast delivery of Turner gauges we urgently suggest the use of the following information. This information will eliminate any oversight in listing specifications and save valuable time in unnecessary correspondence.

1 & 2 STANDARD PLUG AND RING GAUGES

(1) Diameter. (2) Length of gauging surfaces. (3) Tolerance or accuracy. (4) Hardened alloy steel or chrome. (5) No. of Members Go, Not Go, Handles (for plugs only). (6) Complete marking instructions. (7) Date that percentage of total order must be received.

3 SNAP GAUGES

Send complete specifications and blueprints and definite date order must be received.

4 FLUSH PIN

Send complete specifications and blueprints and definite date order must be received.

5 BUILD UP

Send complete specifications and blueprints and definite date order must be received.

ENGINEERS: In designing plug and ring gauges bear in mind that standard lengths will speed up the delivery of your gauges.

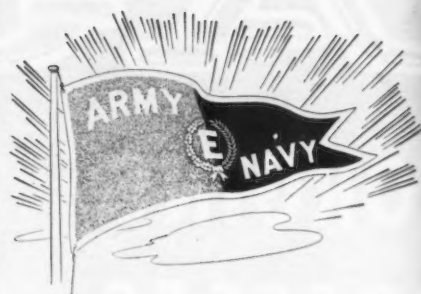


TURNER GAUGE GRINDING COMPANY
2629 HILTON ROAD • • • • • FERNDALE, MICH.



*Send
for this folder
today!*

This new Turner folder will give you information about Turner's line of precision built gauges.



Cited for Award

• • • The following companies recently were awarded the Army-Navy "E" for excellence in war production:

Eclipse Counterbore Co., Detroit.
Westinghouse Electric Elevator Co., Newark, N. J.
Ampco Metal, Inc., Milwaukee.
Alvey-Ferguson Co., Cincinnati.
United Welding Co., Middletown, Ohio.
Michiana Products Corp., Michigan City, Ind.
Alloy Steel Products Co., Linden, N. J.
American Cyanamid and Chemical Corp., Selden Division, Bridgeville, Pa.
Badger Meter Mfg. Co., Milwaukee.
Bridgeport Brass Co., Bridgeport Brass Ordnance Plant, Indianapolis.
Chef Boy-Ar-Dee Quality Foods, Inc., Milton, Pa.
Cleveland Tractor Co., Cleveland.
Cudahy Packing Co., Omaha, Neb.
Curtiss-Wright Corp., Propeller Division, Beaver, Pa.
Defiance Automatic Screw Co., Defiance, Ohio.
Erie Foundry Co., Erie, Pa.
Eureka Tent and Awning Co., Binghamton, N. Y.
Evansville Ordnance Plant, Chrysler Division and Sunbeam Division, Evansville, Ind.
Federal Cartridge Corp., Twin Cities Ordnance Plant, Minneapolis.
Jacob Finkelstein & Sons, Woonsocket, R. I.
International Industries, Inc., Plant No. 2, Ann Arbor, Mich.
Jones & Laughlin Steel Corp., Pittsburgh Works, Pittsburgh.
Lawrence, A. C., Leather Co., Shearling Tannery, Winchester, N. H.
Link-Belt Co., Ewart Works, Indianapolis.
Link-Belt Ordnance Co., Chicago.
Northwestern Machine Corp., St. Louis.
Quaker Oats Co., Cedar Rapids, Iowa.
Resinous Products and Chemical Co., Bridesburg, Philadelphia.
St. Charles Manufacturing Co., St. Charles, Ill.
Thomson Machine Co., Belleville Plant, Belleville, N. J.

Maritime Commission "M"

Swan Island Shipyard, Kaiser Co., Inc., Portland, Ore.
Western Pipe & Steel Co., San Francisco.

Requests Asked in Kilograms For Molybdenum, Tungsten

Washington

• • • Future requests for tantalum, molybdenum and tungsten are to be made in kilograms instead of pounds, the Steel Division announced on Tuesday. Requests for tungsten and molybdenum chemicals and powder should continue to be reported in pounds. The date for filing Forms PD-487 and PD-488 for allocations of tantalum have been changed from the 20th of the month preceding the month for which application is made to the 7th of the month.

AS QUICK

AS SHE CAN SAY JACK ROBINSON...



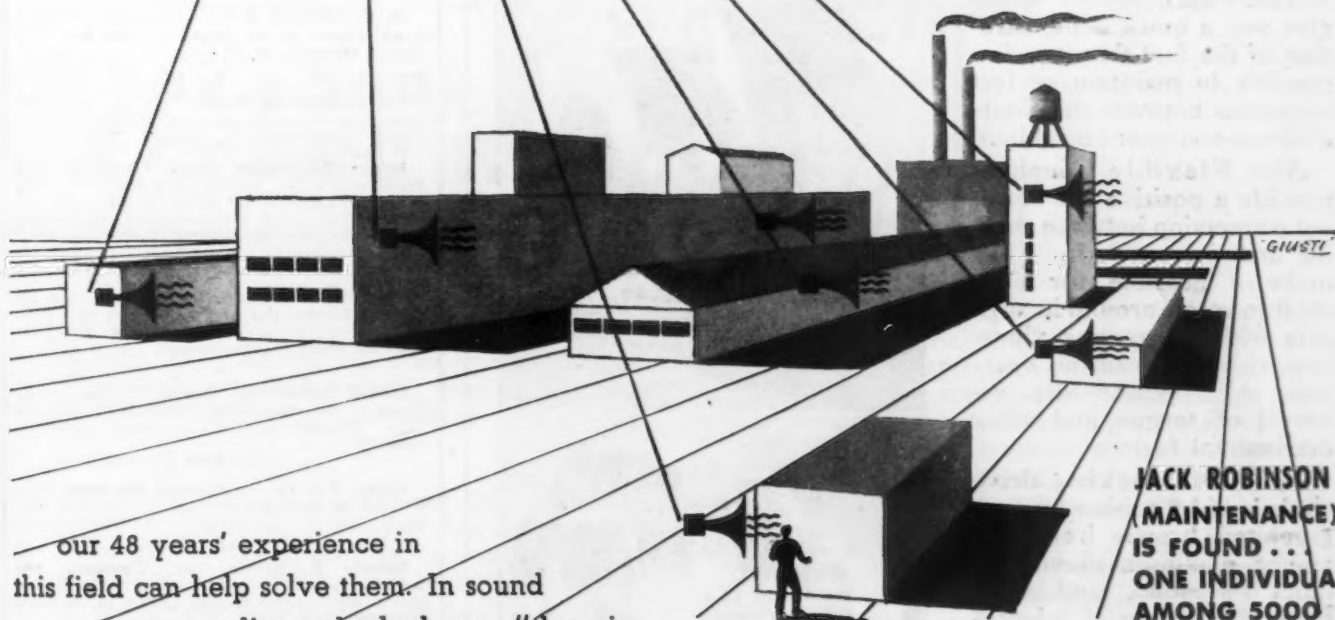
There's a break in the power line . . . and Jack Robinson is lost in the acres of machinery.

Yet he's found in a flash—thanks to Straight-Line Communication.

It's a shotgun that can't miss . . . it reaches individuals, groups, or the entire plant quickly, clearly.

But the amazing thing is that many modern plants still rely on time-wasting indirect methods of communication—despite the fact that paging by Straight-Line Communication does it better and quicker than by any other means. It more than pays for itself in a short period of time.

If your factory or plant has any communications problems whatever . . .



our 48 years' experience in this field can help solve them. In sound systems, radios and telephones, "there is

nothing finer than a Stromberg-Carlson." Why not get in touch with the

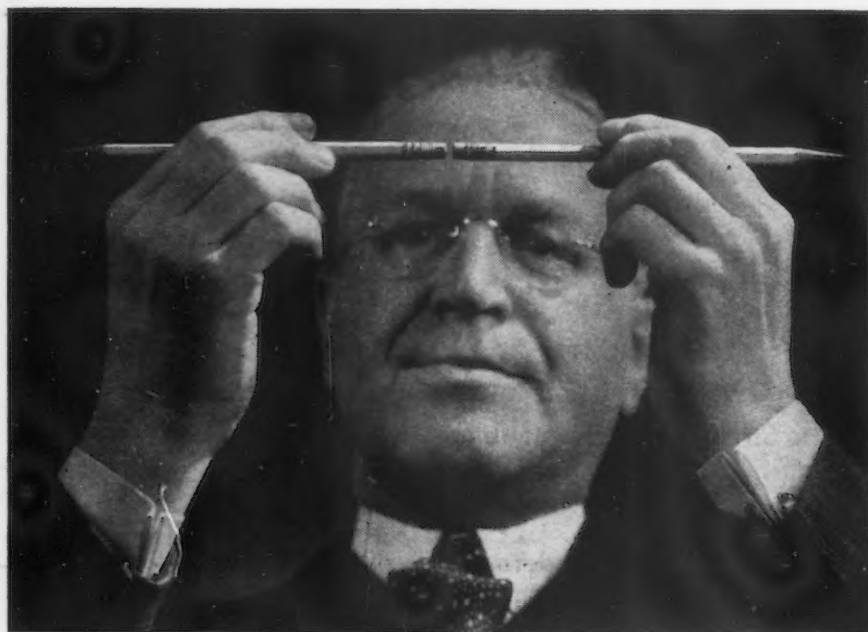
Sound Systems Division of the Stromberg-Carlson Company, 100 Carlson Road, Rochester, New York. Write for free booklet No. 1937.

**JACK ROBINSON
(MAINTENANCE)
IS FOUND . . .
ONE INDIVIDUAL
AMONG 5000**

STROMBERG-CARLSON



STRAIGHT-LINE COMMUNICATION SAVES MANPOWER • SPEEDS THE WORK TO VICTORY



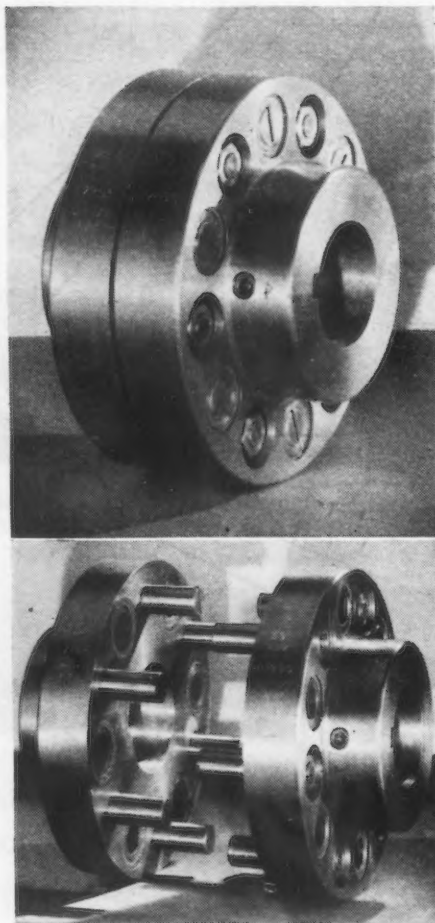
YOU TRY IT...

Take a couple of pencils and try to hold them in perfect alignment without touching each other for 10 seconds and see what happens! It will give you a quick demonstration of the fact that it is impossible to maintain perfect alignment between the shafts of direct-connected machines.

Ajax Flexible Couplings provide a positive but resilient connection between driving and driven shafts. They make it possible for each shaft to rotate around its own axis without creating vibration, chatter, strain on bearings, drag, power loss, reversal of torque and other detrimental factors.

Ajax interlocking drive studs held by rubber bushed, graphited-bronze bearings assure maximum flexibility, quiet operation, and complete elimination of lubrication problems.

Make the 10-second "pencil test" — then write for Facts on Ajax Flexible Couplings.



AJAX Flexible Coupling Co.
Incorporated 1920 **WESTFIELD, N. Y.**

Trade Notes . . .

Schwarze Electric Co., Adrian, Mich., is expanding its plant because of the extensive development in the use of audible electrical signaling systems.

Bellows Division of Cook Electric Co. has opened a new plant at 909 Diversey Parkway, Chicago.

J. H. Williams & Co. will move their Stock Products sales offices from 225 Lafayette St., New York, to Buffalo. A local sales office will be maintained at Lafayette street to serve the metropolitan area.

New Method Steel Stamps, Inc., Campau, Mich., in a recent extension of facilities, took over quarters vacated by the Colonial Broach Co.

White Machine Works, Eau Claire, Wis., has purchased the factory site of the Wisconsin Refrigerator Co.

A. O. Smith Co., Milwaukee, will take over the Minnesota state fair buildings at St. Paul for airplane propeller manufacturing.

John A. Roebling's Sons Co., Trenton, N. J., opened a new department, the Aircord Division, May 1.

Lewis Metal Stamping Co., Sharon, Pa., will be known from now on as the Lewis Machine Co.

E. D. Giberson & Co., Inc., have leased a large warehouse at Grand Avenue and 57th Street, Maspeth, N. Y.

Sonken-Galamba Supply Co. will be known from now on as the Refinery Equipment, Inc.

Briggs & Stratton Corp. announces that Palmer-Shile Co., Detroit, has been placed in general charge of all sales of air saver air valves. Territorial representation, marketing, orders, shipping, invoicing and correspondence will be handled by Palmer-Shile Co.

Ridge Tool Co. has recently moved from its original factory site to a new plant at Elyria, Ohio. The new factory provides five times the working space of the old one.

United States Steel Supply Co. has established a new office at 911 Walnut St., Kansas City. William E. Fry has been appointed manager.

Grobet File Co. of America has more than doubled its factory space at 421 Canal Street, N. Y.

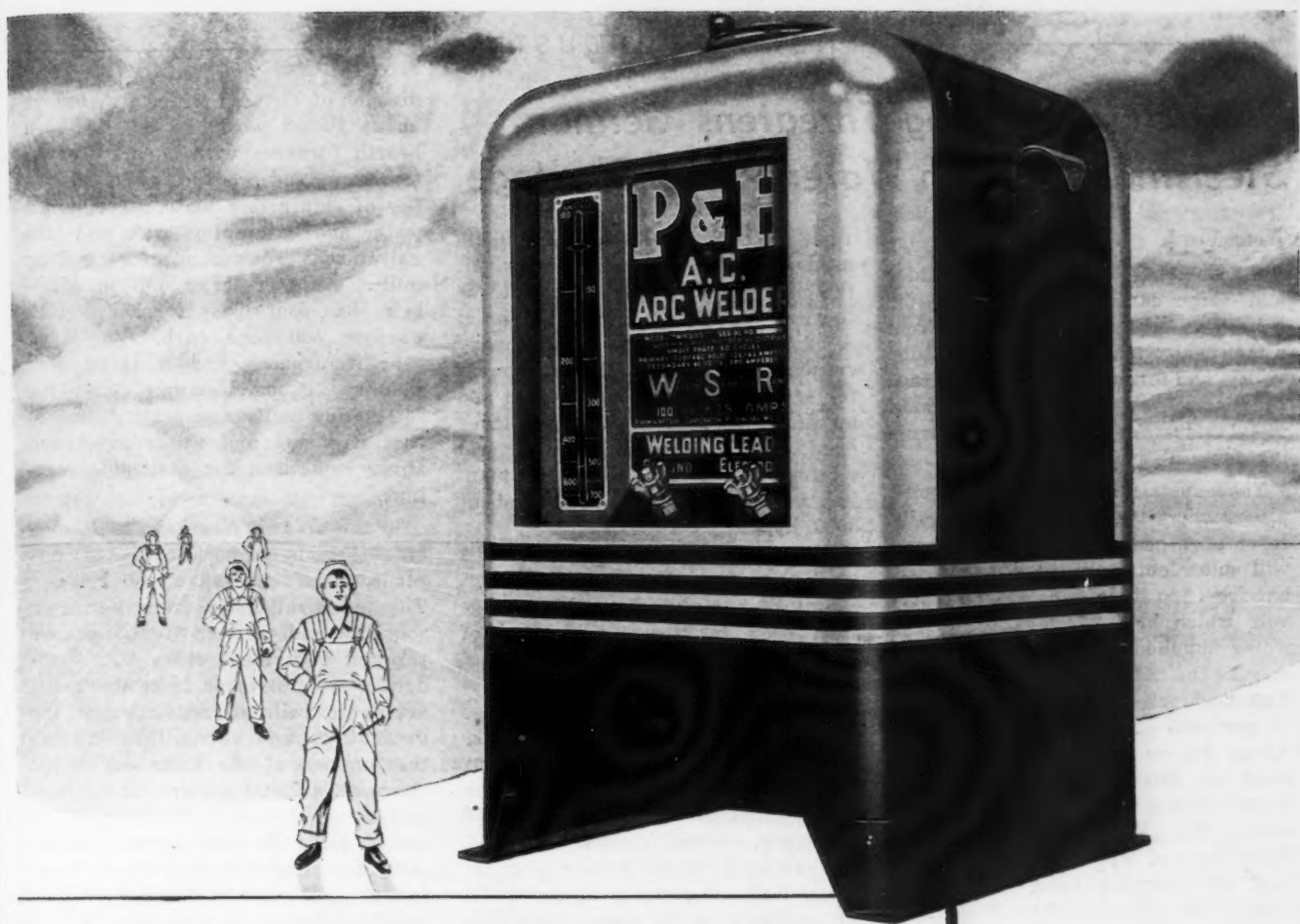
Darwin & Milner, Inc., Cleveland, announces that Handley-Allen-Tapp Co. will represent their firm in the states of Kansas, Oklahoma and Texas.

General Bronze Corp. has acquired Powder Metallurgy, Inc., of Long Island City, N. Y.

Colonial Broach Co. announces the completion of their new plant on Hoover Road, Detroit. The new plant more than quadruples the productive floor space of the company's pre-war facilities.

McKenna Metals Co., Latrobe, Pa., has appointed the following six representatives to their national sales and service organization: Frederick J. Leonard Co., Denver; Bernhard Minch, Buffalo; P. D. Browne, Dallas, Texas; M. L. Ratcliff, Seattle; W. G. Todd, New Orleans; and W. E. Seibold, Tulsa, Okla.

American Pipe & Construction Co., Los Angeles, announces the appointment of Gunite & Waterproofing, Ltd., Montreal, Canada, as Canadian distributors for Amercoat.



What about These New **A.C. ARC WELDERS?**

TO be worthy of the P&H name plate, these new A.C. Arc Welders incorporate every modern refinement which experience and engineering skills can provide.

Industrial Models

The complete line embraces two different series of industrial machines (for intermittent and heavy duty service) with a wide range of capacities. To speed up and maintain welding on a high production basis, all models provide the continuous, concentrated arc which is so easy to control.

Rated on W.S.R. Basis

All models are rated on W.S.R. (Welding Service Range) which designates each machine's usable welding current. Actual delivered output from minimum to maximum capacity is clearly specified.

One Simple Control

Following P&H's policy of utmost simplicity in operation, these new A.C. Arc Welders have

but a single control. Requiring no locking, blocking or other auxiliary devices, this creep-proof micromatic control provides continuous current settings from minimum to maximum capacity. Advanced design and the use of highest quality materials throughout, assure extremely high operating efficiencies. Literature on request.

P&H builds a complete line of A.C. and D.C. Welding equipment as well as a full line of welding electrodes.



General Offices:

4401 W. National Ave., Milwaukee, Wisconsin



Canadian Distribution: The Canadian Fairbanks-Morse Company, Ltd.

Ruhr Dam Bombing Threatens German Steel Industry with Water Power Shortage

New York

• • • Bombing of the Mohne, Eder and Sorpe dams in Germany by the RAF was big news last week. From a man who lived 45 years in the Ruhr valley, and formerly was an important supplier of raw materials to German metal industries come some interesting facts about the region.

The industrial area, except in specific places where the flood waters actually reach open hearth and blast furnaces, will suffer not from too much water, but from too little. The Mohne reservoir which held 134,000,000 tons of water supplied water and power not only to the industries, but also to the Emscherbrecken area which produces 75 per cent of the coal in Germany. About five to six million people depend on this reservoir for water. Hydro-electric plants are built all along the Ruhr river. Between Schwerte and Wetter—approximately half the distance from the Mohne dam to the junction of the Ruhr and Rhine rivers at Duisburg—is located one of the largest electrical power plants. Although the reservoir is situated on the top of a small mountain, the power plant is built at river level.

From Schwerte to Duisburg, a distance of about 35 to 40 miles, there is intense concentration of iron, steel and munition industries. Schwerte, about 30 miles west of the Mohne dam, has a large rolling mill producing wire and steel strips, and one of the largest factories for the manufac-

ture of copper nickel clad bullets used primarily in machine guns. A few miles west of Schwerte, at the town of Wetter, are two vital plants: A large factory producing heavy cranes, machines and other equipment for rolling mills and steel works and an alloy steel factory which has three open hearth furnaces and several electric furnaces. This latter plant has a water power station of about 3000 hp.

The large Bredt & Co. rolling mills at Witten, five miles west of Wetter, supply 80 per cent of the high grade steel used for the manufacture of picks and shovels for German miners, and the army. These mills are supplied with hydro-electric power. Also at Witten is a large steel mill making forgings and castings for ships and railroads. This mill has 10 open hearth furnaces with a capacity of 50 tons each, several electric furnaces, and averages 300,000 tons a year. It is not built at river level, but on a hill overlooking the town. Still further west along the Ruhr river at Hattingen is a large division of Henschel & Son. Built at river level, it has 2 blast furnaces, 10 open hearth furnaces producing 30 to 60 tons each, rolling mills for large steel plates, and a forging plant for shipbuilding and locomotive construction. This mill produces approximately 500,000 tons of steel per year.

Two of the most important towns in this region, Muelheim and Duisburg, are within five to six miles of each other. At Muelheim is a large

division of Thyssen & Co. It employs about 10,000 workers, has 15 open hearth furnaces with capacity of 75 tons each, and produces great quantities of ship armor plate, steel strips, water and gas piping, wire and zinc galvanized equipment for rolling mills. Another large mill in Muelheim has four blast furnaces which produce 500 tons each, four open hearth furnaces and a large iron foundry. It manufactures casting for rolling mills and blast furnaces, cast iron gas and water pipes and silver iron used for malleable castings.

In the area of Muelheim and Duisburg there is a concentration of railroads, canals and strategic bridges. The main rail lines from Berlin to southern and western Germany pass through both these cities. At Speldorf, a short distance from Muelheim, are large railroad repair yards for locomotives and cars. Duisburg, at the junction of the Ruhr and Rhine rivers, is a canal center. It has important canal locks, and a large number of docks for loading boats which carry the vital materials of the Ruhr valley to all parts of Germany.

Stocks of Superior Ore Show Decline Upon May 1

Cleveland

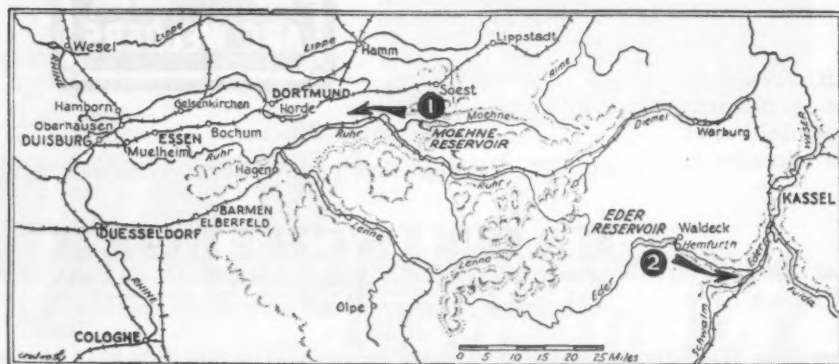
• • • Faced with what observers feel will be a year of unprecedented iron ore consumption, the steel industry stocks of Lake Superior ore in both the United States and Canada on May 1, 1943, totalled 18,496,988 gross tons, or about 1,567,765 tons less than the stocks of a year ago, according to the Lake Superior Iron Ore Association. Of the stocks of May 1, 1943, 15,681,998 tons are at American and Canadian furnaces and 2,814,998 tons are on Lake Erie Docks.

Meanwhile, ore consumption continues at a high rate and total ore consumed during 1943 to date is at a higher rate than ever before. April ore consumption by U. S. and Canadian furnaces was 7,186,201 gross tons down 537,260 tons from March consumption of 7,723,461. However, the total consumption during 1943 was 29,778,750 gross tons, as against 27,677,233 tons during the same period in 1942.

Five less furnaces were in blast in the United States during April than there were during March. On May 1, 169 American and nine Canadian furnaces were in operation.

MAP SHOWS position of Germany's two most important dams, the Moehe and Eder Reservoirs. The successful bombing of the Moehe reservoir will affect the supply of domestic and industrial water to the entire Ruhr valley. Iron, steel and munitions industries of this region are faced with a serious lack of water power.

Map courtesy of New York Times



Will OPA Try to Roll Back Certain Steel Prices? Meeting Arouses Question

By T. C. CAMPBELL,
Pittsburgh Editor

Pittsburgh

••• In the early days of OPA it was intimated by Leon Henderson that the overall steel income would be the determining factor in controlling steel prices. That the OPA may have changed its policy since Mr. Henderson left was indicated here last week when some steel people were left with the impression that the OPA in investigating the tubular industry might use an axe instead of a scalpel. Whether the axe is to have a dull edge remains to be seen. Nevertheless, the appearance of OPA price experts with Army and Navy observers indicates that the tubular industry is due for some sort of "taking apart" pricewise.

Those familiar with the steel industry know that its pricing policy is really simple arithmetic. The ability of steel companies' to sell certain products at a given price always has been predicated upon the knowledge that certain items would help carry the load of the less profitable ones. If the latter are to be depressed or rolled back the OPA most certainly faces the prospect of an intimate study of those products, many of which have been sold at or below cost for the war effort.

There may have been evidence in the past that some segments of the steel industry have anticipated price

difficulties before they actually existed. Further roll backs, however, on some steel items which go to make up the overall steel return picture are most apt to bear out earlier predictions. With 1936 as a base, 1942 steel earnings of nine large companies are only 37 per cent above 1936 and are 20 per cent below 1937. On the other hand, hourly wage rates are 55 per cent above 1936 in 1942 while steel prices on a weighted basis average 15 per cent below 1936. Steel production on the other hand, has increased approximately 61 per cent since 1936.

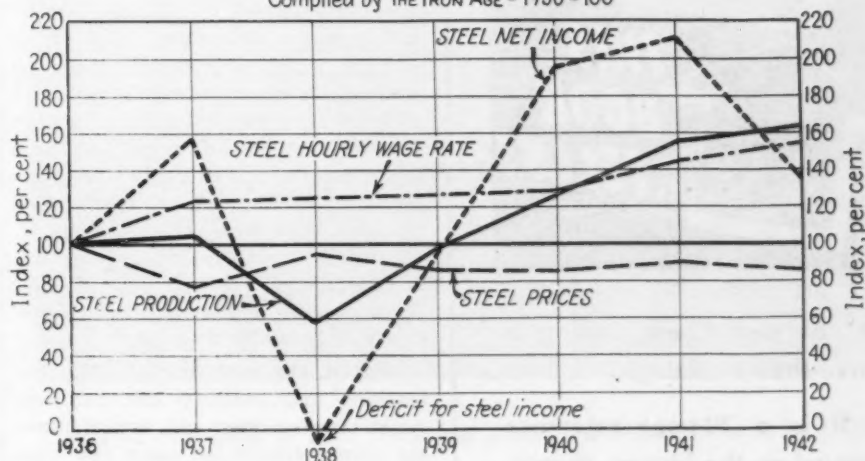
Impartial steel observers believe that before drastic price decreases

are forced on the industry the OPA should at least consult and coordinate with other branches of the government to determine what effect such a roll back will have on the industry generally. Steel officials in many cases are reluctant to express personal opinions on the price question but, on the other hand, would feel better if they believed that a reasonable and fair study would be made of those products which so far have enabled many companies to, figuratively, stay in business. Nowhere is there any realistic belief that the steel industry will escape the most rigid and searching analysis of its entire price set-up. There is, however, a belief, whether true or not, that some governmental officials are not too conversant with the steel industry or its problems.

TRENDS IN STEEL PRODUCTION-PRICES-WAGES-NET INCOME

1936-1942

Compiled by THE IRON AGE* - 1936 = 100



WPB Freeze Order Is Not Expected to Affect Chicago Area

Chicago

••• WPB's announcement of plans to halt virtually all war plant construction which cannot be completed by Oct. 1 and to convert machine tool and some other war goods makers to more urgently needed equipment is expected to have no important effect upon industrial activity in the Chicago area, according to local industrial observers. Actually the announcement was somewhat anti-climactic since most of the steps it dis-

cussed already had been taken, except for the setting of a specific construction deadline.

The bulk of the machine tools made in the area are of a special nature still required in large volume. Several plants produce, for example, forging machines. They still have huge backlogs of highly rated orders, have received no instructions for curtailing production, and do not expect any.

Too, most of the unfinished construction is of a nature which will be brought to completion, as for ex-

ample, several airplane engine and parts plants. It is estimated that of the \$1 billion in new plant construction underwritten in the area since the war began, about \$100 million will be affected by the freeze order.

Observers do not foresee any unemployment here because aircraft plants now being rushed to completion will require from 60,000 to 70,000 employees, more than adequately absorbing any unemployment resulting from curtailment of operations in other plants.

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118—THE IRON AGE, May 27, 1943

Keep Merchandising Tools Sharp, Metal Trades Convention Is Urged

Chicago

●●● In pointing out the factors that are at work at present to alter materially old ways of doing business, J. H. Van Deventer, president and editor of THE IRON AGE, said before the annual convention of the National Metal Trades Association held in Chicago May 26 and 27 that the war is doing away with many old customers, creating a multitude of new ones, shifting buying power on a tremendous scale, establishing new consuming areas, and changing the whole picture of domestic and foreign trade over the entire range of recognized products and services.

The overall picture of the tremendous expansion of productive capacity that has been and is being built can be measured in a number of ways, he said. The increase in national income over 1929, which is the measure of industrial and business activity, is as much as the entire national income of 1931, or from \$79 billion in 1929 to an estimated \$120 billion in 1943. In terms of manpower, this increment of 10 million persons amounts to the entire number of workers that were employed in all of the country's manufacturing industries during the boom year of 1929. Or it can be measured in machines, Mr. Van Deventer went on.

"During the past year of 1942, our machine tool industry has put into American factories and manufacturing plants almost as many new machine tools as it formerly put into them in any normal 10-year period. And mind you, this is not a fair comparison either, because the efficiency level of these tools of today is far above those of a decade ago. So on this basis again, we see a tremendous increase in productive capacity." Tremendous changes are also being made in the geographical location of future markets. There are nearly 400,000 less consumers in New York City and Northern Jersey now than there were two years ago. There are approximately 400,000 more such consumers in Detroit and probably an equal increment on the West Coast. With 10 million new workers coming into the manufacturing industries, there will be 100,000 changes in executive positions.

Employers realize that the earnings of today may have to finance several

years of profitless operation. Labor, he pointed out, does not yet realize that the overtime of today may similarly have to finance the undertime of tomorrow.

With competitive situations changing so rapidly and so greatly most of the market researches might as well be thrown out of the window. New materials, and old materials that will be lower in price will invade markets now occupied by other metals. Aluminum and plastics were two examples of such possible invasions cited by the speaker.

In order to face this changing future, Mr. Van Deventer suggested that every major tool of merchandising be kept sharp and ready for business. Selling, he said, leads production by a very considerable period, varying, of course, with the nature of the product. After the war, we are going to need the finest and fastest equipment for manufacturing that can be had. Competition is going to make it necessary for us to have it.

"A design for living after the war, and for working after the war, calls for redesign to make the things lighter or faster or better or cheaper, yes, and newer."

S. J. Kellerman of the Curtiss-Wright Corp., St. Louis, told the National Metal Trades Association what his company was doing to train new foremen. The company about a year ago installed a foremen's service department to which foremen bring their problems, their questions and also many good suggestions. Its function is advisory.

Speaking about post-war employment, C. Scott Fletcher, director of field development of the Committee for Economic Development, pointed out that the task of providing employment after the war is made lighter by the fact that several millions of the 1943 working force are over-age, under-age or women who voluntarily will return to their homes. The best estimates indicate, he said, that if an employment level of approximately 58 million with a normal work week is achieved a very satisfactory situation will prevail.

On the subject of "Incentive: Key to Increased Production," Phil Carroll, Jr., ridiculed the idea that any certain amount of increased production will result from the use of incentive. That amount depends on whether

the present rate of production is known and whether time facts will be developed and how extensively management will use those facts. Incentive earnings should be paid for good work done in excess of properly established standard requirement. Making incentive effective in turning out more has to be done by hard work on the part of management.

Another responsibility of management, according to T. O. Armstrong, manager of industrial relations of the Westinghouse Electric & Mfg. Co., Springfield, Mass., is making good labor practices work. Top management, he said, must desire an industrial relationship of as high a degree as is possible within the framework of human understanding. Top management must place industrial relations in equal status with other phases of production that it considers essential.

Col. John Slezak, deputy district chief of the Chicago Ordnance District congratulated American industry on its good work. It has made it possible, he said, for our nation to put in the field an Army equipped with the best weapons on any Army in the world.

4200 Vendors Serving As Fisher Body Sub-Contractors

Detroit

• • • Fisher Body Division of General Motors Corp. is utilizing approximately 4200 vendors as sub-contractors, as compared with a normal number of about 1000 in prewar days, it was announced recently.

The suppliers are located in more than 30 plants ranging from coast to coast and from Minnesota to Texas. In turn, Fisher is a sub-contractor to other firms on 20 war jobs.

COMING EVENTS

May 27—American Iron & Steel Institute, New York.

May 27—National Metal Trade Association, Chicago.

June 2 to 3—SAE Diesel Engines and Fuels and Lubricants meeting, Cleveland.

June 7 to 9—American Electroplaters' Society annual convention, Buffalo.

June 9 to 10—SAE War Material meeting, Detroit.

Oct. 13 to 16—The Electrochemical Society, Inc., New York.

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**Fine Grit Dry Belts
Last Longer — Cut
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You only have to TRY these fine grit Silver Streak belts to be CONVINCED they do a better job! They cut faster and cleaner, they stay cool, they won't heat up and draw temper. We would like to prove that they'll last longer than any other abrasive belt you've ever used! Write to us for a FREE SAMPLE Silver Streak Belt—tell us the grit you need, the size of the belt, and the job you want it to do. Give it a trial, and don't pamper it. Silver Streak Abrasive Belts are available in grits 50 and finer. Abrasive Products, Inc., 535 Pearl Street, South Braintree, Massachusetts.

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JEWELITE • JEWEL FLINT • NEW PROCESS

Rated Warehouse Orders Placed on A Par With Equivalent Numbered Orders

Washington

• • • Direction No. 1 to CMP Regulation No. 3 has been revised to indicate that its intention is to place rated orders of dealers, distributors and jobbers on a par with orders in the same rating band bearing allotment numbers or symbols, WPB an-

nounced last week. The direction does not have the effect of granting rated orders of dealers, distributors and jobbers preference over other orders in the same rating band not bearing allotment numbers or symbols.

This means that a dealer's order rated AA-1 would have preference

equal to a manufacturer's order rated AA-1 bearing an allotment number. However, the dealer's order rated AA-1 would not displace a manufacturer's order rated AA-1 in a production schedule. The direction has also been revised to apply the equality of dealers', distributors', and jobbers' rated orders to all such orders. Previously it applied only those placed prior to April 7, calling for delivery not later than June 30.

Allotment Numbers as "Up-Rating" Device Ended

Washington

• • • Use of allotment numbers as an up-rating device for obtaining non-controlled materials will end on June 30, the CMP Division of WPB has announced. This action was taken in CMP Regulation No. 3, as amended.

Orders placed during the second quarter, accompanied by preference rating and allotment number, will continue to be "up-rated" orders. However, the application of an allotment number to a rated order after June 30, will not have any effect on the rating. For example, an order placed in June with a rating of AA-2X to which an allotment number is applied in July, and an order placed in July with a rating of AA-2X and bearing an allotment number, will both be deemed equal in rating to orders rated AA-2X to which no allotment number or symbol is applied.

Virginia Beehive Coke Producers Get 25c Increase

• • • OPA on May 22 provided beehive coke producers of Wise County, Va. with a 25c. per ton increase in maximum prices thus increasing the ceilings to vary from \$6.75 to \$7.25

CMP Developments

• Provisions for the increasing or decreasing allotments of critical materials has been made through the use of forms CMPL-200 and 201 on a revised production schedule authorized on CMP-4A, 4B, 4C and CMPL-150. (CMPL-253)

• Suggested forms for use by contractors in extending allotments of controlled materials to their sub-contractors have been issued. Forms for use by manufacturers in increasing or decreasing allotments of controlled materials to their sub-contractors have also been issued. (WPB-3607)

• Preference ratings assigned under Regulation No. 5 to a particular business may be used to obtain MRO items for general offices, branch offices, salesrooms and other facilities essential to the conduct of the business, under Interpretation No. 5 of the regulation. (Release No. WPB-3633)

Cut out "fatigue-lag"



with these power-operated work tables!

THE lag in production experienced in the late hours of the shift, on any purely hand-operated machine, is eliminated on Gardner Single-Spindle Disc Grinders with the use of Mechanically-Oscillated Work Tables.

Here is a No. 226-26" machine equipped with 2 such tables, which make it possible for an operator to merely load and unload the fixtures. One operator is, however, required for each end of the grinder.

The job shown is transmission covers, in 2 sizes, as seen in the foreground. The smaller size is ground at the rate of 60 to 70 per hour, and the larger size, at 75 to 85 per hour. They are held within .004" to .006" for flatness.

Now, when production must be held at high levels, plan to cut out "fatigue-lag" with a Power-operated GARDNER GRINDER!

WRITE FOR BULLETIN 200B

GARDNER - GRIND
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GARDNER MACHINE COMPANY

412 East Gardner Street, Beloit, Wisconsin, U.S.A.

WPB Says It's BARS You Can't Ship

Washington

• • • WPB has amended Direction 5 to CMP Regulation No. 1 to make it clear that the direction refers only to carbon or alloy steel bars instead of all carbon or alloy steels as previously stated. The direction prohibits steel producers from shipping normalized or heat-treated carbon or alloy steel bars on any commercial warehouse order. However, if steel to fill such orders has already been, or was in process of being normalized or heat-treated on April 19, it may be shipped when and as completed, if the orders are otherwise validated in accordance with WPB regulations. Shipments for aircraft use are not affected by the prohibition.

for blast furnace coke; \$7.25 to \$7.75 for foundry coke and \$5.25 to \$5.75 for nut coke. The action taken in Amendment No. 15 to MPR No. 121 is effective May 28. The increase levels prices with the Connellsville base.

Production of Steel Pit Castings Assisted

Washington

• • • Because of the limited facilities for producing and machining steel pit castings, WPB said last week that it has found it necessary that they should be produced and machined when facilities are available even though such operations may be in advance of the need for the finished product. To facilitate this action, WPB issued Inventory Direction No. 8 under CMP Regulation 2, to exempt deliveries of steel pit castings from the restrictions of Paragraph (b) (1) of the Regulation. All other provisions of the CMP regulation continue to apply.

Closure Makers Urged To Use Electrolytic Plate


Washington

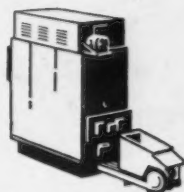
• • • Estimating that it will save approximately .75 lb. or 60 per cent of the tin in each base box, WPB last week issued an amendment to Conservation Order M-104, directing closure manufacturers to use .50 electrolytic tinplate to the greatest extent available instead of hot dipped tinplate. It was stated that production

of .50 electrolytic tinplate is now sufficient to meet all requirements for closures. Previously the use of any .50 electrolytic tinplate in such closures was not required, except for closures for home canning jars. Hot dipped tinplate with a tin coating of 1.25 lb. per base box was permitted.

Manufacturers may use, instead of .50 electrolytic tinplate, any "menders" arising in the production of .50 electrolytic tinplate which have been hot dipped with a maximum tin coat-

ing of 1.25 lb. per base box. A "mender" is a reject sheet of electrolytic tinplate which has been converted into a prime or second grade sheet by hot dipping. Wherever tinplate is permitted by the order, manufacturers also may use any tinplate which has a coating of 1.25 lb. per base box, if on May 17, it was in process, in the inventory at the tin mill for the account of a closure manufacturer, or in the inventory of a closure manufacturer.

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a heating system
that's easy on scarce materials?



here is one eminently suited to war-time requirements. Recent installations show substantial metal savings over central steam heating plants and distributing systems. After initial material savings, come reduced man-hour requirements for installation and maintenance. Last but not least is the daily saving of fuels—oil, gas or coal. How each self-activating Dravo Direct Fired Heater works; its high efficiency; its flexibility of installation; favorable savings over conventional systems are explained in Dravo booklets 505-6.

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Pittsburgh, Pa.

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DIRECT FIRED
HEATERS

New Production Control Bureau To Set CMP-Priority Regulations

Washington

• • • Organization of the Production Controls Bureau and assignment of principal functions to its organizational units has been completed, J. A. Krug, Program Vice Chairman of WPB, announced last Saturday.

The Production Controls Bureau, of which Harold Boeschenstein is Director, consists of the following four organizational units: (1) Office of the Director, (2) Controlled Materials Plan Division (3) Scheduling Production Division, and (4) Inventory Policy Division.

The Production Controls Bureau develops policies, plans, and general methods for controlling distribution of materials, for scheduling production and delivery of products, and for controlling inventories. These plans and policies are subject to review of the Program Vice Chairman, after consultation with the Operations Vice Chairman, the controlled materials divisions, and other appropriate organizational units of WPB, and Claimant Agencies.

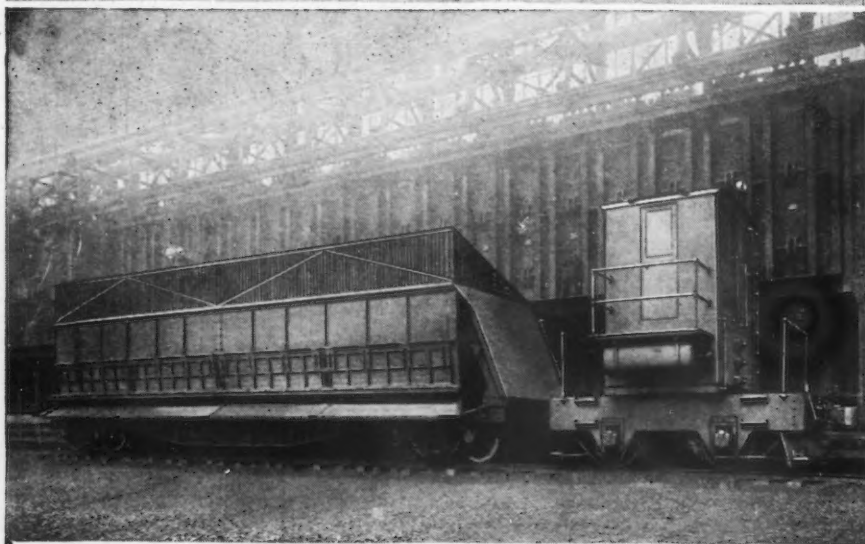
The Director is responsible for general supervision and coordination of the work of the organizational units of the Bureau. The Director is primarily responsible for initiating appropriate priorities regulations, CMP Regulations, regulations to govern scheduling, and other regulations applicable to more than one industry for controlling the distribution of materials, for scheduling production and delivery of products, and for controlling inventories.

The Controlled Materials Plan Division is charged with recommending policies, plans, and general methods for controlling the distribution of materials, and for maintaining a continuous review of the over-all operations under resulting directives.

The Production Scheduling Division is responsible for recommending policies, plans, and general methods of scheduling production and delivery of products.

The Inventory Policy Division is responsible for recommending policies to govern adjustment of or limitation of industrial inventories, and for maintaining a continuous review of over-all operations with respect to such industrial stocks for the purpose of recommending long-range control plans.

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All Atlas Coke Oven Equipment is of heavy-duty construction permitting the peak operating conditions required in today's stepped-up production schedules. As a result of years of experience, Atlas is able to design and build equipment, to meet the requirements of each particular coke plant. Detailed information available on request.

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Controlled Material Used By Producer Requires Allotment

• • • The use by a controlled materials producer of aluminum produced by him constitutes a delivery of controlled material if the aluminum is converted or processed into any other than a controlled material form or shape, and is subject to the provisions relating to such deliveries. This means that such a producer must obtain an allotment of the necessary controlled material.

Direction 8 to CMP Regulation No. 1 provides that this procedure is also applicable to the processing of aluminum ingot into sheet, plate, bar, rod, extrusions, castings or powders; of

Price Briefs

• Amendment 85 to MPR No. 146 simplifies the establishment of manufacturer's maximum prices on casters. The amendment becomes effective May 24. (Release No. OPA-T-888.)

• Amendment No. 5 to Revised Supplementary Regulation No. 1 broadens the exemption from the General Maximum Price Regulation on sales of any used, damaged or waste materials sold, delivered or transferred by the War or Navy Departments. The order becomes effective May 28. (Release No. OPA-T-908.)

extrusions in the form of tube looms into tubing; of rod or bar into wire, cable, rolled structural shapes or forgings; of wire into rivets; of sheet or strip into foil; of sheet or plate into forgings, pressings or impact extrusions, and of extruded shapes into forgings.

As a result of the direction, a producer of aluminum may not convert it for his own use beyond the specified forms or shapes except on an authorized controlled materials order or by specific direction. Before July 1, the use of an order to which a preference rating has been extended is permissible.

Allotment Extensions for Class A Products Clarified

••• When manufacturers buy Class A product parts such as springs, screw machine parts, and stampings, for incorporation in their products and also resell some of them as repair parts, they may, under certain circumstances, make allotments to their suppliers for both, WPB announced.

Priority Changes

L-38—Amended order makes several technical changes in controlling production and delivery of commercial and industrial refrigeration and air conditioning machinery. (5-20-43)

L-170 and L-170-a—Amended orders, modify restriction on the manufacture of certain items of farm equipment requiring copper and rubber. (5-18-43)

L-268—Amended order modifies provisions governing the manufacture and distribution of oxy-acetylene apparatus. (5-19-43)

L-295—Order places control over the production and distribution of dental burs, the tips used in dental drills. (5-21-43)

M-2-b—Order provides that magnesium scrap can be disposed of only by sale to a producer or approved smelter of magnesium. (5-18-43)

M-9-c—Amended order tightens various provisions of the order, others found unworkable are relaxed, and still other provisions are clarified. (5-17-43)

M-311—Order stops scrapping of serviceable used automotive parts. (5-20-43)

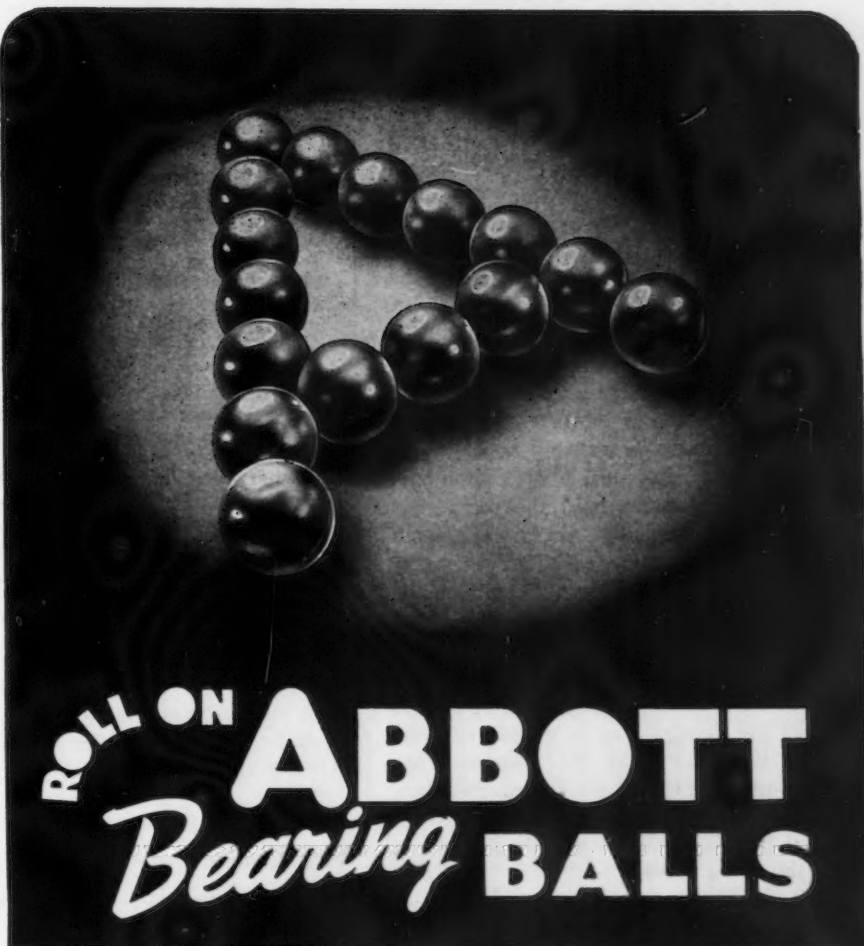
M-319—Order provides for the allocation of the supply of manufactured crude abrasive and abrasive grain, used to make grinding wheels, sandpaper and other abrasive products. (5-22-43)

Priority Reg. No. 1—Use of manufacturing facilities has been ordered to be made subject to the preference rating system under the terms of an amendment under Priorities Regulation No. 1. (Order covered in THE IRON AGE, May 20, page 148, Release No. WPB-3579.)

Under usual procedure, manufacturers of Class A products who sell them for use as maintenance, repair or operating supplies, are required to obtain an allotment of materials for their manufacture from the appropriate WPB Industry Division. Such items are handled exactly as though they were Class B products. Application for the allotment should be made on Form CMP-4B, except for such items as are directly pur-

chased and programmed by a Claimant Agency.

However, according to Interpretation No. 7 of CMP Regulation No. 1, if it is impracticable for the manufacturer of the part to segregate those sold for resale as repair parts from those sold for use as production material, he should obtain an allotment from his customer covering his requirements for the manufacture of both.



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Longer Transition Period Believed Needed to Put Steel on 48-hr. Week

Cleveland

• • • While it cannot be regarded as the basis for delaying steel industry plans to go on a 48-hr. work week, War Manpower Commission officials in Cleveland feel that because of the strong protests to the 48-hr. week order offered by the industry a setback in the July 1 deadline is likely. Thus far, only one steel company in the Cleveland, Youngstown, and southern Ohio areas has officially gone on a 48-hr. week, this being the National Tube Co., at Lorain, Ohio.

It was planned by the company even before the industry-wide order that 25 per cent of the working force would go on the longer working schedule within a week, 50 per cent more in another three weeks, and the balance as fast as absorption could take place with the entire company on the 48-hr. work week schedule by about June 1.

Before this step, National Tube was averaging for all employees about 46 hr. a week, and in spite of the very small step-up in working hours, there has been considerable trouble developed. Absentees hold the company's average to about 46 hr. a week, even though on a 48-hr. schedule. In going on the longer work week, there was of necessity considerable downgrading of help, which didn't go over too well with the affected employees. Furthermore, in spite of the fact that details of the change-over in work week had been agreed to by the labor-management committee a strike occurred during the past week tying up operations at the No. 1 Seamless mill, protesting the 48-hr. week.

Because National Tube has changed over to the 48-hr. week, in spite of difficulties, it has proved to the satisfaction of local WMC officials that the change-over can be made industry-wide. There has been no actual reduction in the number of employees at National Tube, and requirements for new help are still substantially above the supply.

There is no question that the 48-hr. week will increase production costs, but WMC regards this as not of its concern. It is felt that if the increase in cost is sufficiently high, OPA will have to make adjustments in steel prices.

By forcing the matter, the WMC

makes it necessary to develop quickly new techniques in employee utilization, wholesale downgrading of employees, and new working schedules for entire organizations. Steel officials feel that because of the complexity of the steel business and variety of oper-

Living Costs Lead Pay Formula by 6.7%

Washington

• • • Average living costs of city workers are now about 6.7 per cent above the increase equalized by the "Little Steel" pay formula, according to latest statistics released last week by Secretary of Labor Perkins. These show the total rise since January, 1941, as 21.7 per cent as compared with the 15 per cent allowed by the pay formula.

In the month ended March 15 living costs are shown by the report to have increased 1.5 per cent over the preceding month; 5.9 per cent above May, 1942 (the end period of the pay formula); and 122.8 per cent over the level of the 1935-39 average.

ations and other factors that must be taken into account, the changeover to the 48-hr. week should be gradual to be really effective.

WLB Collecting Wage Data as Basis for Decisions

Cleveland

• • • The regional War Labor Board is gathering wage data in this area to determine wage brackets for particular job classifications to be used in applying the recent policy directive of Economic Stabilization Director, James F. Byrnes. The board has been directed to establish brackets of sound and tested rates for various occupations and, except in rare and unusual cases, the board is authorized to approve increases only up to the minimum rates in such brackets. Rates will not be brought up to the average rates in the area or industry, but only to the lowest rates for the par-

ticular occupations that are found to be sound and tested rates.

The Byrnes directive did not return the WLB's wage policy to what it was before President Roosevelt issued the "hold the line" order, No. 9328, on April 8. This directive establishes concrete limitation on WLB's authority to make wage adjustments intended to aid in the prosecution of the war or to correct gross inequities between rates for the same occupations in different plants. Therefore, inequalities will no longer be a basis for an increase in wages.

Rate brackets will be fixed according to areas. Under the "hold the line" order, the WLB may still approve wage increases up to 50c. an hour to correct substandards of living and increases under the 15 per cent "Little Steel" formula. However, the board is starting at once to establish brackets and issue decisions based on these brackets. The most critical occupations in the most critical industries and areas from the standpoint of the war effort will be of first consideration to the board.

Hiring Plan Hits Another Snag; Possible Complete Failure Seen

Buffalo

• • • The War Manpower Commission's proposed "controlled referral plan" of hiring male workers through the USES in the Buffalo-Niagara Falls area hit another snag this week when members of the local WMC committee flatly refused to accept any "mythical" setup of wage scales to remedy pay inequalities.

Lillian Poses, WMC regional attorney, warned the plan would be forced into effect regardless of the committee's attitude but nothing came of it. Hugh Thompson, CIO regional director, annoyed by the "heat" being put on the local committee by Washington, placed the blame for the hiring muddle on "obstructionists" in the Capital.

Originally scheduled to go into effect weeks ago, the job hiring plan has been kicked around so much that some members of the committee doubt if it ever will be in force. Meanwhile, plants continue to hire direct at their own employment offices instead of through the USES as prescribed in the plan.

Batcheller Says War Steel Needs Met; Still None for Civilian Articles

Washington

• • • From a viewpoint of supply the United States is reaching a new stage in the war where the pipelines of the principal steel consuming war industries have been filled. But the time is far away when there will be any steel except for essential uses.

This is the message Steel Director H. G. Batcheller gave to the American Steel Warehouse Assn. meeting in a speech delivered at the Plaza Hotel in New York on May 25.

"Arsenals, shipyards, tank plants, gun factories, aircraft factories—all have been given the material to keep them at capacity production," Mr. Batcheller said.

At the same time Mr. Batcheller told them that their inventories of general steel products were not likely to reach adequate volume for many months. Yet, he pointed out, that they would be expected to make shipments as promptly as though stocks were adequate, and that the Steel Division would make every effort to see that inventories were maintained at the highest possible working level.

Warehouse operators were thanked for their cooperation in the distribution of steel for war use but were told they had to accomplish things in the months to come "beyond their capacity" to do them. Mr. Batcheller cited the performance records of the warehouses in making NE steels available to consumers, the "capacity-plus" job done by the continuous

strip mills and the producers of alloy steel.

Alan Wood President Is New Steel Division Deputy

Washington

• • • John T. Whiting, president of the Alan Wood Steel Co., has accepted appointment as deputy director of the WPB Steel Division. Mr. Whiting, who assumed his duties on Monday, replaces Alexander Brown, Cleveland-Cliffs Iron Co. executive, who was forced to resign because of demands for his services by his company.

Deegan Gets SWPC Post

Washington

• • • Thomas J. Deegan, New York, has been appointed director of information, WPB Smaller War Plants Corp.

Steel Mills Instructed To Accept Small Orders

Washington

• • • WPB Steel Division Director H. G. Batcheller last week instructed steel producers that small orders which can be placed on mill schedules without loss of production should be accepted. Producers were notified on Feb. 1 that orders for less than minimum mill quantities should be

rejected except under unusual circumstances. The purpose was to avoid frequent changes with resultant loss of output.

Mr. Batcheller said, as an example, that a producer should reject an order for less than a minimum quantity if at the time the order is presented he had no melting or rolling schedule of the particular grade or size involved, nor any reasonable prospect of being able to ship it in the month required.

"On the other hand, he is not justified in rejecting the order if it can be included in scheduled rollings without detriment to his overall production," he said.

Arc Welding Speed

(Concluded from Page 59)

50 per cent it would be 1.5 and at 100 per cent it is 2, and so on.

In this respect as a convenient method of adapting the chart to a particular condition, it is suggested that duplicate negative photostats be made, from one of which the auxiliary scale bisecting the line *F* be cut and superimposed on the other with the appropriate constant coinciding with the right index of the scale above the line as 1.4 does with 1 at the right end of the scale. As many positive photostats as required may then be made of the composite negative photostats.

The actual production rate is found by correcting the welding speed found on *C* by the duty cycle previously employed in determining the unit cost. The same percentage (duty cycle) of the deposition rate, from scale *A*, for the electrode selected, will determine the weight of metal deposited per hour. To this must be added 16-2/3 per cent (if 14 in. electrodes are used), to compensate for the 2 in. stub ends wasted, plus an additional allowance (of from 8 to 15 per cent) for the coating to determine the total weight of electrode consumed per hour. The data for the example worked out in the chart are presented in the accompanying table.

It should be noted that the chart, as such, is devoid of any speculative element, and is simply a mechanical device correlating diversified variables with a mathematical accuracy equivalent to a 6½ in. slide rule to which it is similar.

OUTPUT BOOSTER: Herbert Middendorf, machine operator producing parts for the Packard PT-boat engine believes in his slogan "American ends with I CAN." His wife, shown with him, inspects small parts for Packard-aircraft engines. They have two sons in the Air Corps.



PERSONALS

• **A. S. Thaeler** has been promoted to the post of assistant chief engineer of U. S. Steel's Federal Shipbuilding & Dry Dock Co., Kearny, N. J.

High speed and maneuverability of many modern merchant vessels are due in part to Mr. Thaeler perfecting details of high pressure steam propulsion equipment in which Federal pioneered. This work was conducted by Mr. Thaeler as scientific engineer of Federal under William W. Smith, chief engineer of the company. In his new position, Mr. Thaeler succeeds **Charles H. Johnson**, who was granted a leave of absence by Federal to serve the United States Maritime Commission. Mr. Johnson had been with the shipyard since 1920 and became assistant chief engineer in 1929.

• **Ralph J. Kraut**, a director and former personnel manager of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has been promoted to the rank of major in the army at Camp Wolters, Tex.

• **William E. Fry** has been appointed manager of the newly established Kansas City, Mo., office of the United States Steel Supply Co. Mr. Fry was formerly a salesman in the company's St. Louis warehouse.

• **Milton Levenson**, president and treasurer of the Roxbury Iron & Metal Co., has gone overseas to supervise battlefield scrap salvaging. He has been given rank as captain.

• **A. E. Bedell** has been appointed chief engineer of Graver Tank & Mfg. Co., Inc., East Chicago, Ind., in charge of all engineering and development covering all divisions of the company. He was formerly associated with Max B. Miller & Co., Inc., for 14 years, in charge of engineering.

• **Malcolm E. Erskine**, newly elected president of the Manufacturers' Association of Racine, Wis., is not a director of the Twin Disc Clutch Co., as was reported in the April 8 issue.

• **Leigh Willard**, once an Allis-Chalmers draftsman, has been elected a company director of Allis-Chalmers Mfg. Co. He will fill the vacancy left on the board by the death of Max W. Babb. Mr. Willard is also president and director of the Interlake Iron Corp. He came to Allis-Chalmers as a draftsman before the turn of the century. For several years after 1922 Mr. Willard operated an industrial engineering office in New York. After



A. S. THAELER, assistant chief engineer of Federal Shipbuilding & Dry Dock Co., Kearny, N. J.

making a survey of a group of coal mines for the Allied Chemical & Dye Co. in 1927, he was placed in charge of engineering and construction for the Semet-Solvay Co., an Allied subsidiary, and later became its president.

• **E. H. Dorenbusch** has been appointed general traffic manager for the American Rolling Mill Co., Middletown, Ohio. Mr. Dorenbusch joined the Armco organization in 1911 as a traffic clerk. In 1920 he became chief clerk of the traffic department. In



E. H. DORENBUSCH, general traffic manager for the American Rolling Mill Co., Middletown, Ohio.

1927 he was made senior traffic manager. He has been an active member and an official of a number of organizations of traffic managers.

• **Robert R. Zisette** has been appointed general sales manager of SKF Industries, Inc., Philadelphia. He started with SKF in 1921. After one year in engineering and sales departments, he became sales engineer in the Cleveland office. He remained in this position for seven years, then was promoted to district manager of the Cincinnati office. In 1942 he was promoted again, this time to the office of assistant sales manager.

• **Elmer R. Miller**, manager of the molded goods department of the industrial products sales division of the B. F. Goodrich Co., retired from active service on May 1 after 44 years with the company. Starting as a stenographer in 1899, he was made assistant manager of molded goods several years later and has been manager since 1910.

• **Frederick S. Rowe**, who joined the Westinghouse lamp division, Bloomfield, N. J., at the age of 16 as a production clerk, has been appointed manager of electronic tube production and stocks. **William J. Knochel** has been named assistant superintendent of electronics manufacturing.

• **Dr. Donald H. Powers** has joined the staff of Merrimac Division of Monsanto Chemical Co., Everett, Mass., specialists on applications of Monsanto chemicals in the textile industry. Although his headquarters will be in Everett, Dr. Powers will serve as consultant for all Monsanto divisions on textile applications. He has had fourteen years of experience in textile research and production.

• **Elden R. Carl** has been appointed director of industrial relations of Adel Precision Products Corp., Burbank, Calif. Formerly assistant director of industrial relations of North American Aviation, Inc., Mr. Carl was previously manager of industrial relations of the Solar Aircraft Co. Prior to that time, he spent 10 years in New York City and Washington, D. C., where he held important industrial and governmental labor posts.

• **Roland R. Ware**, for the past thirteen years general manager, was elected president of Clarage Fan Co., Kalamazoo, Mich., at the annual meeting held May 7. Mr. Ware succeeds Harry Clarage who was named chairman of the board of directors.

Other officers elected **S. A. Schaeffer**, vice-president, **C. A. Kline**, secre-

tary, and C. C. Wheeler, treasurer. In addition to being president, Mr. Ware will continue to be general manager.

- **L. W. Long** has been appointed sales engineer in charge of mixed apparatus sales of the Allis-Chalmers Mfg. Co., Milwaukee. Mr. Long joined Allis-Chalmers in 1925 and until May 1 served as sales engineer in this firm's Pittsburgh office.

- **Theodore Trecker, Sr.**, head of Kearney & Trecker Co., Milwaukee, was the guest of honor at a banquet attended by firm officials and leading citizens to commemorate the 45th anniversary of the founding of the firm in 1898 by Mr. Trecker and the late E. J. Kearney.

- **Melbourne H. Steil**, for several years assistant general superintendent of the shops at the Beloit, Wis., works of Fairbanks, Morse & Co., has been appointed general superintendent to succeed Ray Saveland, resigned.

- **W. W. Cargill** has been reelected president of the Ray-O-Vac Co., Madison, Wis. **Don W. Tyrell** has been made first vice-president and general manager.

- **Charles F. Rohleder** has been appointed factory superintendent of Maas & Waldstein Co., Newark, N. J. Mr. Rohleder, has held the position of chief chemist since 1937.

- **Lorin W. Grubbs**, abrasive engineer for Norton Co., Worcester, Mass., for the states of Virginia, North Carolina, South Carolina and part of West Virginia and Tennessee has been commissioned a lieutenant (j.g.) in the United States Navy. **Charles A. Babbitt**, who has had experience in the Norton research laboratories and in field work, will take over Mr. Grubbs' territory.

- **Robert G. Bloom** has been appointed controller of Lukens Steel Co., Coatesville, Pa., succeeding William J. Bassett, retired.

- **W. B. Muse** has been appointed sales manager of Industrial Abrasives, Inc., Chicago. Mr. Muse has been sales manager of the Sterling Tool Products Co. for several years.

- **John D. Orr**, executive secretary of the Massachusetts salvage committee, has been made New England regional salvage manager of WPB. He succeeds **J. Burleigh Cheney**, who resigned to take a post in a war industry. Before joining the WPB, Mr. Orr was Boston district manager assistant of the Western Union Telegraph Co.

- **William Clarkson Heath**, president of the A. O. Smith Corp., Milwaukee,

has been elected a director of the Chicago Federal Reserve bank to succeed the late Max Babb, former chairman of the board of Allis-Chalmers Mfg. Co.

- **George L. Altman** has joined the staff of Maysteel Products, Inc., Mayville, Wis. He will be in complete charge of purchasing.

- **John W. Haddock** has resigned from the Sullivan Machinery Co., Michigan City, Ind., to become presi-

dent of the Farrel-Birmingham Co., Ansonia, Conn. Mr. Haddock, during his association of more than 20 years with Sullivan, advanced from an apprentice to vice-president in charge of engineering and sales.

- **O. J. Neslage** has been appointed general sales manager of the Sullivan Machinery Co., Michigan City, Ind. He has served as manager of the company's Mexico City, Joplin, Salt Lake City and New York territories.

OBITUARY...

- **Mark Henry Damerell**, for the last 26 years connected with Wyman & Gordon Co., Worcester, Mass., died May 16, aged 77 years. In addition to his forging practice Mr. Damerell was also a practical die cutter, and a designer of several machines.

- **William Morgan Nash**, head of the Gilbert Nash Co., Menasha, Wis., died at his home recently from the effects of a heart attack. A native of Neenah he graduated from Marquette university and went to work for various Chicago paper mill firms before returning to join his father in the Nash firm at Menasha.

- **Charles Sahlstrom**, vice-president of American Manganese Steel Division, American Brake Shoe & Foundry Co., died recently at the Mayo Clinic, Rochester, Minn. Mr. Sahlstrom, 57 years old at the time of his death, had been associated with the company for 35 years, and served as vice-president for the past 20 years.

- **Charles G. Tufts**, personnel director for the J. I. Case Co., Racine, Wis., for the last three years and former controller and personnel manager of the Seaman Body Co., Milwaukee, died May 8 at Rochester, Minn., after a short illness. He was 54 years old.

- **Edward F. Niedecken**, who retired three years ago as president of the Hoffmann & Billings Mfg. Co., Milwaukee, and whose invention of a mixing valve for shower sprays were among his numerous contributions toward the advancement of the plumbing industry, died May 9, aged 71 years.

- **Harry Arthur Henderson**, assistant to general superintendent, South works, Carnegie-Illinois Steel Corp., died recently. He was 65 years old. He started work at South works at the age of 15 in the auditing department. In October, 1936, he became assistant to general superintendent.

At the time of his death he had been employed for 50 years.

- **Hugo V. Lucas**, president and treasurer of A. Lucas & Sons, Peoria, Ill., died May 8.

- **Clarence S. Angell** died recently in Massachusetts. He was president of Belcher & Loomis Hardware Co. until 1900 when he became president of the Union Hardware Co. and later of the Atlantic Coast Hardware Co. of Boston.

- **Ernst Felix Koehler**, credited with developing the first six cylinder motor car engine, consulting engineer and inventor of a gas mask used in World War No. 1, died May 11 in Somerville, Mass. He came to the United States from Germany in 1910.

- **Joseph R. Worcester**, nationally known steel structural engineer, designer and consultant died May 9 in Waltham, Mass., aged 83 years. In 1921 Mr. Worcester was appointed to a committee to draft building codes and material standards.

- **William Henderson**, retired General Electric Co. engineer and formerly night superintendent and general foreman of the River works engineering and maintenance division died Friday, May 14. He was 69 years old.

- **Angus MacArthur**, 54, vice-president and director of Koppers Co., Pittsburgh, and general manager of its gas and coke division, died May 9, aged 54 years. He had been associated with Koppers since 1920 when he joined the organization as operating engineer. He was promoted to his latest position in 1933, and was transferred from Pittsburgh to New York in 1939.

- **John Gillen**, founder and president of the John Gillen Co., Cicero, Ill., died May 4, aged 70 years. Previous to 1920 when Mr. Gillen started his own company, he was western manager of Standard Gauge Steel Co., formerly of Beaver Falls, Pa.

MACHINE TOOLS

. . . Sales, Inquiries and Market News

Hiring Policy Liberalized in Ohio

Cincinnati

• • • Recent passage by the Ohio Legislature of the bill removing some handicaps to employment of women in industry is expected to assist machine tool operators. The supply of available male employees constantly is being reduced. The recent bill, however, increases the amount of lifting women may do and makes it possible to employ them any time of the day and authorizes a 50-hr. week with an even longer week, provided notification is made to the state industrial department.

The recent visit of Tell Berna, general manager of the National Machine Tool Builders' Association to Cincinnati, and a published interview with him in the papers, tended to alleviate somewhat the psychological effect produced by WPB suggestion to the machine tool industry of reducing its production. In his interview, he pointed out that there was no need for employees in the industry to fear loss of jobs in the near future, because Russia is depending upon the United States alone for her machine tools, and second, the industry has a backlog of orders totalling \$600,000,000 which would keep the plants running full blast for at least six months; third, replacements will be needed, and fourth, depending on the turn of the war, many new orders might be placed. He also indicated that after a conference with WPB officials a press release had been issued, and

Certain Tools Not Affected by Cut-Back

Washington

• • • The curtailment of machine tool production, to be accomplished by WPB by December, has been described as bringing the manufacturing rate back to "peacetime levels." The fact is that no one knows how far production is going to be limited, except that it is likely to be cut sharply.

Certain not to be affected by the individual curtailment orders to be issued to each company are the following machine tools: gear shapers, spur and helical, internal and external; plane cylinder grinders, 6-in. and more; DH planers, 48-in. and over; cylindrical grinders external and internal; precision boring machines; way and special drilling machines; and external thread grinders. These tools have been designated as critical, according to a WPB spokesman.

a new procedure had been established to taper off machine tool orders and construction in the industry. This new procedure, he indicated, would not affect the industry's output. In the meantime, members of the United Electrical Radio and Machine Workers Local (CIO) have been issuing statements in the public press about meetings of the labor union, calling upon the industry to plan immediately for large scale conversion.

Shift from Direct Selling To Dealer Representation Seen

Cleveland

• • • The coming months will see many personnel changes, especially in the sales divisions, of machine tool builders. The trend has already started and is, fundamentally, the result of the decline in machine tool orders. District offices of builders that were set up at the beginning of the machine tool boom a few years ago, in many instances are slated for consolidation and in many instances complete abandonment.

On the other hand, machine tool

dealers, many of whom lost some pretty big accounts at the beginning of the war, will handle more lines as a result of the closing up of these direct sales outlets by the builders, since sales efforts in the areas affected cannot be abandoned entirely. This is quite a natural development since the dealers only make what they earn on sales while the salaries and expenses of regional offices continue on at a fairly constant rate regardless of business volume coming through.

Within the past two weeks, at least three companies have declared their intention of closing district offices or expanding their sales outlets

through dealers. One, a builder of large presses in the East, closed a midwestern sales office, consolidating it with an office in another city. Meanwhile, dealer outlets are being sought in the affected areas.

Likewise, two midwestern manufacturers have released sales managers and, with the appointment of new ones, announced that greater use would be made of dealer outlets. Every prosperity period is accompanied by the establishment of new sales offices by builders and when things begin to slack such retrenchment as is now taking place is almost inevitable.

Builders, on the whole, are a bit baffled by the recent order curtailing machine tool production. With the exception of a few specific types of equipment, the falling off of new business and the cleaning up of backlogs has taken care of machine tool production curtailment in a far more efficient manner than any government order ever could. Furthermore, as to building machine tools for stock, this is not being done and probably couldn't be done even if the builders had any desire to do so.

Tools today are built on order and material is obtained by builders on this basis. No builder could receive sufficient material to build for stock purposes since material is purchased either on priorities or under CMP, both of which restricts its use to equipment for war or highly essential civilian purposes.

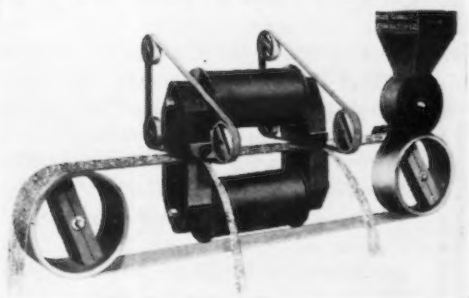
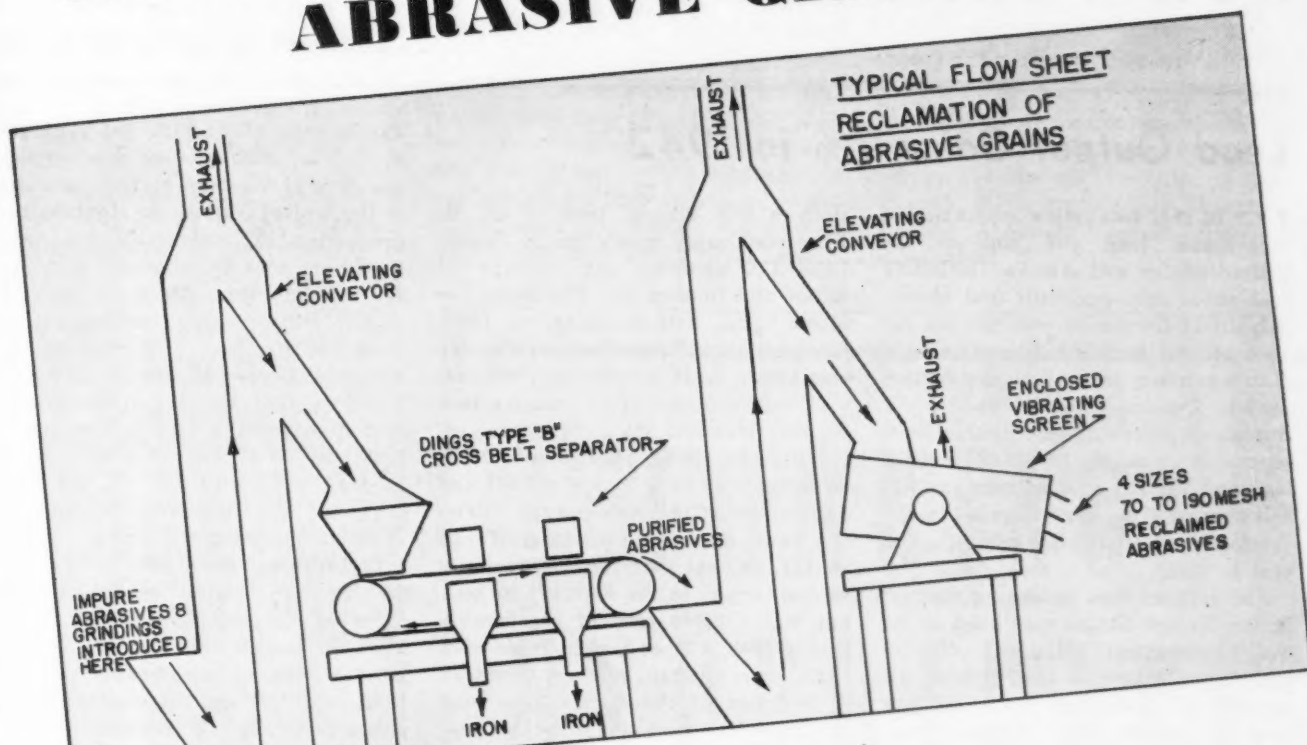
Cleveland Pneumatic Tool Granted \$24,000,000 Loan

Cleveland

• • • A \$24,000,000 revolving credit, said to be the largest war financing provided for a Cleveland manufacturer for working capital purposes, has just been completed for the Cleveland Pneumatic Tool Co. and its subsidiary, Cleveland Pneumatic Aerol, Inc. Announcement of the loan, arranged under Federal Reserve Regulation V through a group of 12 banks, was made by Daniel C. Green, chairman of the board and chief executive officer of both companies. Each company is to receive \$12,000,000.

Banks forming the group joining in the loan, which carries the guarantee of the War Department of the United States, are headed by Central National Bank of Cleveland.

RECLAIM ABRASIVE GRAINS



PRINCIPLE OF OPERATION OF DINGS CROSS BELT SEPARATOR

Material to be purified is carried on a belt under a series of highly intensified magnetic zones. Magnetic material is attracted upward to the under surface of the cross belts which carry it to the side beyond the magnetic influence, where it is discharged. Non-magnetic material is discharged at the end of the main belt.

The intensity of each magnetic zone can be controlled independently so that materials of varying magnetic susceptibilities can be separated from each other. These units can be built with as many zones and cross belts as desired.

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The flow sheet illustrated is being used by a middle-western plant which is reclaiming approximately 1500 lbs. of grain per day. Sweepings are collected from both rough and finish grinding operations and are found to average approximately 15% iron and 85% abrasive. The reclaimed grain is mixed with virgin grain, in a ratio of 1/3 reclaimed to 2/3 new, to make rough grinding wheels only. These have been found entirely satisfactory, comparing favorably with those using all new abrasive. The entire installation paid for itself in a relatively short time.

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NON-FERROUS METALS

... Market Activities and Prices

Lead Output Gains 7% in 1942

• • • In 1942 total mine production of recoverable lead and zinc in the United States and Alaska (including that made into pigments and chemicals direct from ore) was 492,435 net tons of lead and 760,210 net tons of zinc, according to preliminary figures at the Denver office of the U. S. Bureau of Mines. These figures compare with an output of 461,426 tons of lead and 749,125 tons of zinc in 1941 and show a 7 per cent increase in the production of lead and a gain of 1 per cent in zinc.

The largest lead producing district in the United States continued to be the southeastern Missouri district with a production of 195,750 tons, an increase of 31,408 tons from the 1941 total of 164,342 tons. Output from this district alone accounted for about 40 per cent of total domestic production. The greater part of the produc-

tion in this district came from St. Francois County where the St. Joseph Lead Co. operated four groups of mines and four mills. The Mine La-Motte Corp., with its mine and 1000-ton (daily) mills in Madison County was also a large continuous producer.

Mine production of recoverable lead in the Western states (Alaska included) was 254,113 short tons in 1942, an increase of 7562 tons over 1941 and 52 per cent of domestic output. Idaho was again the largest producer of lead in the several Western states and second largest in the country; its output was 112,300 tons of recoverable lead in 1942, a 7 per cent increase over 1941. Seven mines in Idaho produced 85 per cent of the state's total lead output; these were, in order of production Bunker Hill & Sullivan, Hecla, Morning, Page, Star, Sherman and Tamarack & Custer. Utah, producing

70,062 tons of lead in 1942, ranked second in production of lead among the several Western states and third in the United States. In Montana the production of recoverable lead was 19,500 net tons as compared with 21,259 tons in 1941. About 34 per cent of the state's output was recovered from the zinc-lead properties of the Anaconda Copper Mining Co. at Butte. The 8 per cent decrease in the production of recoverable lead in Montana in 1942 may be attributed to the closing in May of nearly all the zinc-lead mines of the Anaconda Mining Co. at Butte, including the Emma mine.

In breaking down zinc production, the Eastern states, comprising in order of output, New Jersey, New York, Tennessee and Virginia, yielded 197,415 tons of recoverable zinc in 1942, or 26 per cent of total domestic production. Zinc production in both New York and Tennessee was higher than in any previous year. The Central States (which are in order of output Oklahoma, Kansas, Missouri, Illinois, Wisconsin, Kentucky and Arkansas) produced 256,352 tons of recoverable zinc, a decrease of 19,654 tons from the 1941 production of 276,006 tons. The Tri-State, or Joplin, region of Oklahoma, Kansas and southwestern Missouri produced 236,695 tons of recoverable zinc in 1942, 92 per cent of the Central states and 31 per cent of the nation's output. In 1942 operators in the region treated 8,513,600 tons of zinc ore and 9,921,000 tons of tailings. The total quantity of zinc-bearing ore mined and milled increased 6 per cent from 1941, but the average yield of recoverable metals (combined zinc and lead) per ton of rock decreased 12 per cent. The decline in zinc production is therefore not due to a decline of mining activity in the region, but due to a decline in the average grade of crude zinc and zinc-lead ore treated.

The Western States output of recoverable zinc in 1942 was 306,443 tons, an increase of 24,634 tons over 1941. This gain may be attributed to the more favorable price of zinc and to the premium pay program of Metals Reserve Co. for production from individual mines in excess of quotas based on 1941 production. Idaho was the largest producer of zinc among the Western states and set another high by producing 86,350 tons last year.

How many FEATHERS in a Hen?

Our department of weights and standards, after plucking several specimens, has placed the problem back in our laps with no answer.

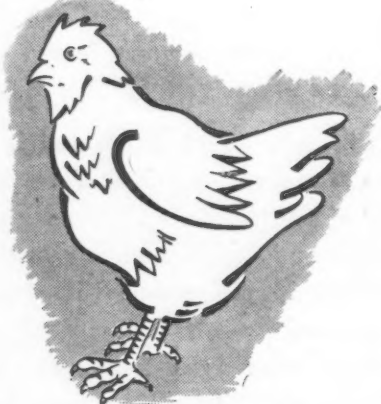
Many spring users have placed spring problems hard to solve in our hands to analyse and standardize. Scientific control of materials, close supervision of manufacture, automatic heat-treating, and accurate inspection and testing will give your springs a uniform degree of performance that eliminates kick-backs.

Buy springs that give known performance!

DUNBAR SPRINGMAKERS
SPRINGS WIRE FORMS SMALL STAMPINGS

DUNBAR BROS. CO., Bristol, Conn.

Division of Associated Spring Corporation



Labor Shortage Hurts Mines

• • • Shortage of manpower is beginning to affect the copper mining operations of the Miami Copper Co., although so far this year, the activities of the company have been satisfactory, E. H. Westlake, vice-president, told stockholders at the annual meeting held May 20.

Mr. Westlake said that Castle Dome Copper Co., wholly owned subsidiary of Miami Copper, is expected to be in operation soon. Plants and other facilities are about completed and production from this open pit ore body should start shortly.

Sale of Mg Scrap Limited

• • • Under WPB Order M-2-B, magnesium scrap can be disposed of only by sale to a producer or approved smelter of magnesium, the Aluminum and Magnesium Division pointed out. Sales of magnesium scrap to dealers (and hence purchases by dealers) are prohibited without specific WPB permission.

Although a dealer may not buy magnesium scrap for his own account, he can collect magnesium scrap as an agent for a magnesium producer or approved smelter, under an agreement with the producer or smelter. Dealers who discover magnesium scrap received in other scrap metal should dispose of it by sale to a producer or approved smelter, or through a dealer who is an agent or such companies.

Floods Cut Zinc Production

• • • The Zinc Division of WPB has received word that the floods in the Tri-State region have begun to recede sufficiently to permit inspection of the mines and facilities in the flood areas to determine the extent of the damage. It is thought that about 85 per cent of the district's zinc production has been curtailed by the high water and that it will take about six weeks to

two months before normal operations can be resumed.

Mexico to License Metal Exports

• • • Through unofficial sources, it has been learned that the Mexican Government has placed lead and other metals and minerals on its export control list. What these other minerals are has not yet been announced in this country, but they would require an export license before they could be ship-

ped out of the country. The text of the law is expected in the consulate office on May 30.

Scrap: To Be or Not to Be

• • • To determine whether a piece of material or equipment should be used in its present form or termed scrap, the Special Projects Salvage Branch, WPB, is publishing, bi-monthly, the "Available Used Material and Equipment Bulletin."

FORGING EXPERIENCE MAKES TIME

It takes well rounded production experience to know where to make time—time that makes possible more production of war implements at a faster rate. T & W Forging Engineers comprehend production operations clear through to the assembly line. T & W forgings, formed to close tolerances, are the result of a determination to reduce the machining and finishing time to an irreducible minimum, thereby gaining time for more production.



TRANSUE & WILLIAMS

STEEL FORGING CORPORATION · ALLIANCE, OHIO

Sales Offices in New York, Philadelphia, Chicago, Indianapolis, Detroit and Cleveland

Non-Ferrous Prices

(Cents per lb.)

Copper Electrolytic, Conn. Valley.....	12.00
Copper Electrolytic, New York.....	11.75
Copper, Lake	12.00
Tin, Straits, New York.....	52.00
Zinc, East St. Louis.....	8.25
Zinc, New York	8.67
Lead, St. Louis	6.35
Lead, New York	6.50
Aluminum, Virgin 99+%, delivered...	15.00
Nickel, Electrolytic, base refinery.....	35.00
Magnesium, 99.8% ingot, per lb.....	22.50

Miscellaneous Non-Ferrous Prices

ALUMINUM, No. 12 remelt, 14.50c.; No. 2, standard, 14.50c. a lb. ANTIMONY, Asiatic, New York, nominal; American, 14.50c. a lb., f.o.b. smelter. QUICKSILVER, \$197 to \$199 per 76 lb. flask, f.o.b. shipping point. BRASS INGOTS, commercial 85-5-5-5, 12.25c. a lb.

Collections Progressing; Public Slow

Boston

• • • Without fanfare, reports here indicate, salvaging of iron and steel scrap is progressing. Best results are being obtained from industries and abandoned rail projects. However, the novelty of salvaging has worn off as far as the general public is concerned. Occasionally in townships patriotic citizens work up public enthusiasm, but returns from such drives are usually unimportant.

Lack of public interest is generally attributed to the slow removal of scrap piles collected during initial drives. Week after week and month after month scrap piles were eyesores to the community wherein they reposed. Even today junk piles collected more than a year ago are visible. The average citizen came to believe that the government, after all, did not want the scrap and in that case questioned all the hysteria of the initial scrap drive days.

Government salvaging agents now say public attitude is justified under the circumstances. They add, they never should have led the public to suppose that scrap would be collected immediately and shipped to steel mills. The agencies say the public should have been educated scrapwise as are the English people.

In England, they say, scrap piles are maintained as long as possible as reminders to the public that the drive is always on and that it is up to John Public to constantly add to the pile. Under the English scrap salvaging plan, collections are made with some degree of foresight because sorting of materials is mainly by collectors, government agents here say. As scrap piles are seldom exhausted there is always known the semi-graded backlog of scrap for steel mills. The main advantage, according to U. S. agents, is the constant reminder to the English people that the drive is still on.

during the past several days turning receipts have slowed up.

There have been occasional reports that some grades of scrap have been selling below ceiling prices, but investigations fail to reveal that any such cases have occurred in the Cleveland district.

PITTSBURGH—Scrap market here indicates a fair balance between supply and demand. Conditions are about the same as they have been for the past several weeks.

CINCINNATI — Dealers warning that there is possibility of a tightening in the scrap supplies this fall, bore fruit during the past week, when some dealers indicated that a noticeable interest among the cast iron consumers to buy for inventory developed. While the movement was not a strong one, dealers feel that it is the beginning of a forward buying movement among the scrap users generally.

BUFFALO—First boat load of scrap was headed downlake from the Duluth area this week and scrap-laden barges were coming upstate via canal from the seaboard. High water was delaying the arrival of barges. Meantime, heavy allocations from nearby states continued to Buffalo area consumers to offset inroads on stockpiles resulting from the month's delay in the opening of Great Lakes.

BOSTON—Heavy and almost continuous rains the past week virtually stopped work at many yards, while brokers, who anticipated releases of shipments contracted for before May 15 when the 6 per cent tax was removed, say they did not mature to any extent.

ST. LOUIS—Although steel mills in the St. Louis industrial district have not been damaged by the worst floods in 99 years the continued rains and rising rivers still hamper the movement of scrap iron to this market. Thousands of freight cars are tied up as a result of the floods, slowing up movement to mills. Mills are well supplied with reserve stocks.

PHILADELPHIA—Mills are accepting very little scrap and choosing the heavy grades when they do take it. There will be on June 1 a new jalopy drive to be conducted throughout Pennsylvania, Maryland, Virginia and Delaware. Philadelphia's experimental drive held in April netted 400 jalopies in excess of the average monthly receipts of 80 automobile graveyards. These 400 "extra" jalopies will produce about 300 tons of iron and steel scrap.

CHICAGO — Rain and floods in the Midwest have seriously affected the flow of scrap in this area. Mills report a notable letdown in receipts recently, although high rate earlier in the Spring, which permitted some replenishment of inventories, is serving to cushion the present slowdown. Shipments of farm and outlying industrial scrap has been especially hard hit by the floods.

WPB Reorganizes Salvage Division Branches

Washington

• • • Operations vice-chairman, Donald D. Davis, has issued Administrative Order No. 3 outlining new functions of the WPB Salvage Division over which he has general supervision. The Salvage Division will be established with four branches under a Director. The branches will be: General Salvage, Industrial Sal-

vage, Scrap Processors and Special Projects Salvage.

Under the order, the division will be responsible for the salvaging of secondary materials, where they appear unlikely to be used in present form, up to the point where such materials are prepared by dealers or others to be made available to consumers.

Commercial Scrap Drive Planned in Ohio

Cleveland

• • • In addition to the continuing drive to keep industrial scrap moving to the mills, it is contemplated in this area by scrap dealers and WPB to inaugurate a commercial scrap campaign. This commercial drive will include laundries, bakeries, and similar business establishments, but will not take in household scrap. It is felt that many organizations and businesses of this kind have an accumulation of scrap and obsolete equipment that might be scrapped, and will help in the drive for both ferrous and non-ferrous metals.

There is expected in this area more or less a crisis in scrap supplies by the end of August, since scrap production is not keeping up sufficiently to consumption. The bulk of the scrap moving into the eastern Ohio district is in the form of turnings and very little in the form of heavy melting and cast grades are forthcoming.

While a commercial scrap drive has not been announced as yet, it is believed that completed plans will be set forth by June 15, and the drive will start almost at once.

CLEVELAND—Cast scrap and heavy melting grades are extremely scarce, and

SCRAP PRICES

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				Low Phos.		Heavy Structural and Plate			Foundry Steel				Alloy Free Low Phos. Turnings	Heavy Axle and Forge Turn. First	Electric Furnace Bundles
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Bk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaked* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crank-shafts				
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton.....	\$20.00	\$15.00	\$15.00	\$16.00	\$17.00	\$17.50	\$25.00	\$22.50	\$21.50	\$22.00	\$22.50	\$21.50	\$22.00	\$21.00	\$21.50	\$18.00	\$19.50	\$21.00
Cleveland, Middletown, Cincinnati, Portsmouth.....	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point..	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	19.75	16.75	18.25	19.75
Ashland, Ky.....	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.....	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.....	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	19.25	16.25	17.75	19.25
Duluth, Minn.....	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	19.00	16.00	17.50	19.00
Detroit, Mich.....	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	18.85	15.85	17.35	18.85
Toledo, Ohio.....		12.85	12.85	13.85	14.85	15.35												
St. Louis, Mo.....	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	18.00	15.00	16.50	18.00
Minnequa, Colo.....	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	17.50	14.50	16.00	17.50
Seattle, Wash.....	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.00	15.00	12.50	14.00	15.50

^aBaled turnings are \$5 per gross ton higher.

BUNDLES: Tin can bundles are \$4 below dealers' No. 2 bundles. No. 3 bundles are \$2 less than No. 1 heavy melting.

AT NEW YORK city or Brooklyn, the maximum shipping point price is \$15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is \$25.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of \$6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 65c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. *At Cincinnati, for basic open hearth grades, foundry steel and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport. Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakland, Cal.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing

point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton*, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.* For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be \$3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made \$4) less maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge \$2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), \$1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), \$2 less than No. 1 heavy melting. If loaded in box cars add 75c.

UNPREPARED CAST IRON SCRAP—Except for heavy breakable cast, unprepared scrap is given a price ceiling of \$2.50 per ton less than the maximum prices for the corresponding grade of prepared cast iron scrap. Where scrap is to undergo preparation prior to arrival at the point of delivery, such scrap is not considered at shipping point until preparation is completed.

Consumers of cast scrap may pay the shipping point price plus established charge for transporting the scrap to their planes. In the case of deliveries by truck, the cast scrap buyer must obtain from the seller a certification, made out to OPA.

*At Memphis 50c.; Great Lakes ports \$1; New England \$1.25.

RAILROAD SCRAP

	Scrap Rails					
	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	3 ft. and Under	2 ft. and Under	18 in. and Under
Cleveland, Cincinnati, Ashland, Portsmouth, Middletown.....	\$20.50	\$21.50	\$23.00	\$23.50	\$23.75	\$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown.....	21.00	22.00	23.50	24.00	24.25	24.50
Chicago, Philadelphia, Sparrows Pt., Wilmington..	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco.....	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo.....	20.25	21.25	22.75	23.25	23.50	23.75
Detroit.....	18.85	19.85	21.35	21.85	22.10	22.35
Duluth.....	19.06	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.....	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.....	19.25	20.25	21.75	22.25	22.50	22.75
Seattle.....	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis.....	18.50	19.50	21.00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast.....	\$18.00	\$19.00	\$20.00
Clean auto cast.....	18.00	19.00	20.00
Unstripped motor blocks.....	15.50	16.50	17.50
Stove Plate.....	17.00	18.00	19.00
Heavy Breakable Cast.....	15.50	16.50	17.50
Charging Box Size Cast.....	17.00	18.00	19.00
Misc. Malleable.....	20.00	21.00	22.00

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas and Florida.

Group C: States not named in A and B: switching district of Kansas City, Kan., Mo.

Tool Steel Scrap Ceiling Prices Set by MPR 379, May 4, 1943

BASE PRICE SEGREGATED		BASE PRICE UNSEGREGATED SOLIDS		BASE PRICE UNSEGREGATED TURNINGS	
Solids lb. cont. W	Turnings lb. cont. W				
Type 1.....	\$1.80	\$1.50 per lb. contained W if 5% or more.		\$1.30 per lb. contained W if 5% or more.	
Type 2.....	1.60	\$1.15 per lb. contained W if over 1%—less		\$1.00 per lb. contained W if 1%—less than	
Type 3.....	1.25	than 5%.		5%.	
Type 4*.....	0.125	\$0.80 per lb. contained Mo if 1½% or more.		\$0.70 per lb. contained Mo if 1½% or more.	
Type 5*.....	0.135				

*Per lb. of scrap material.

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in Italics. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Hot rolled sheets.....	2.10	2.10	2.10	2.10
Cold rolled sheets.....	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00

Tin and Terne Plate: (Dollars Per Base Box)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Tin plate, standard cokes	\$5.00	\$5.00	\$5.00	\$5.00
Tin plate, electrolytic...	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30

Bars and Shapes: (Cents Per Lb.)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302).	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40

Wire and Wire Products: (Cents Per Lb.)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55

Rails: (Dollars Per Gross Ton)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Heavy rails	\$40.00	\$40.00	\$40.00	\$40.00
Light rails	40.00	40.00	40.00	40.00

Semi-Finished Steel: (Dollars Per Gross Ton)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Rerolling billets	\$34.00	\$34.00	\$34.00	\$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00

Wire Rods and Skelp: (Cents Per Lb.)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
No. 2 fdy., Philadelphia...	\$25.89	\$25.89	\$25.89	\$25.89
No. 2, Valley furnace...	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti...	24.68	24.68	24.68	24.68
No. 2, Birmingham.....	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa...	25.39	25.39	25.39	25.39
Basic, Valley furnace...	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago...	31.34	31.34	31.34	31.34
Ferromanganese	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Heavy melt'g steel, P'gh.	\$20.00	\$20.00	\$20.00	\$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh...	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia.	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go.....	20.00	20.00	20.00	20.00

Coke, Connellsville: (Per Net Ton at Oven)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Furnace coke, prompt...	\$6.50	\$6.50	\$6.50	\$6.00
Foundry coke, prompt...	7.50	7.375	6.875	6.875

Non-Ferrous Metals: (Cents per Lb. to Large Buyers)	May 25, 1943	May 18, 1943	Apr. 27, 1943	May 26, 1942
Copper, electro., Conn...	12.00	12.00	12.00	12.00
Copper, Lake, New York.	12.00	12.00	12.00	12.00
Tin (Straits), New York.	52.00	52.00	52.00	52.00
Zinc, East St. Louis....	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	22.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

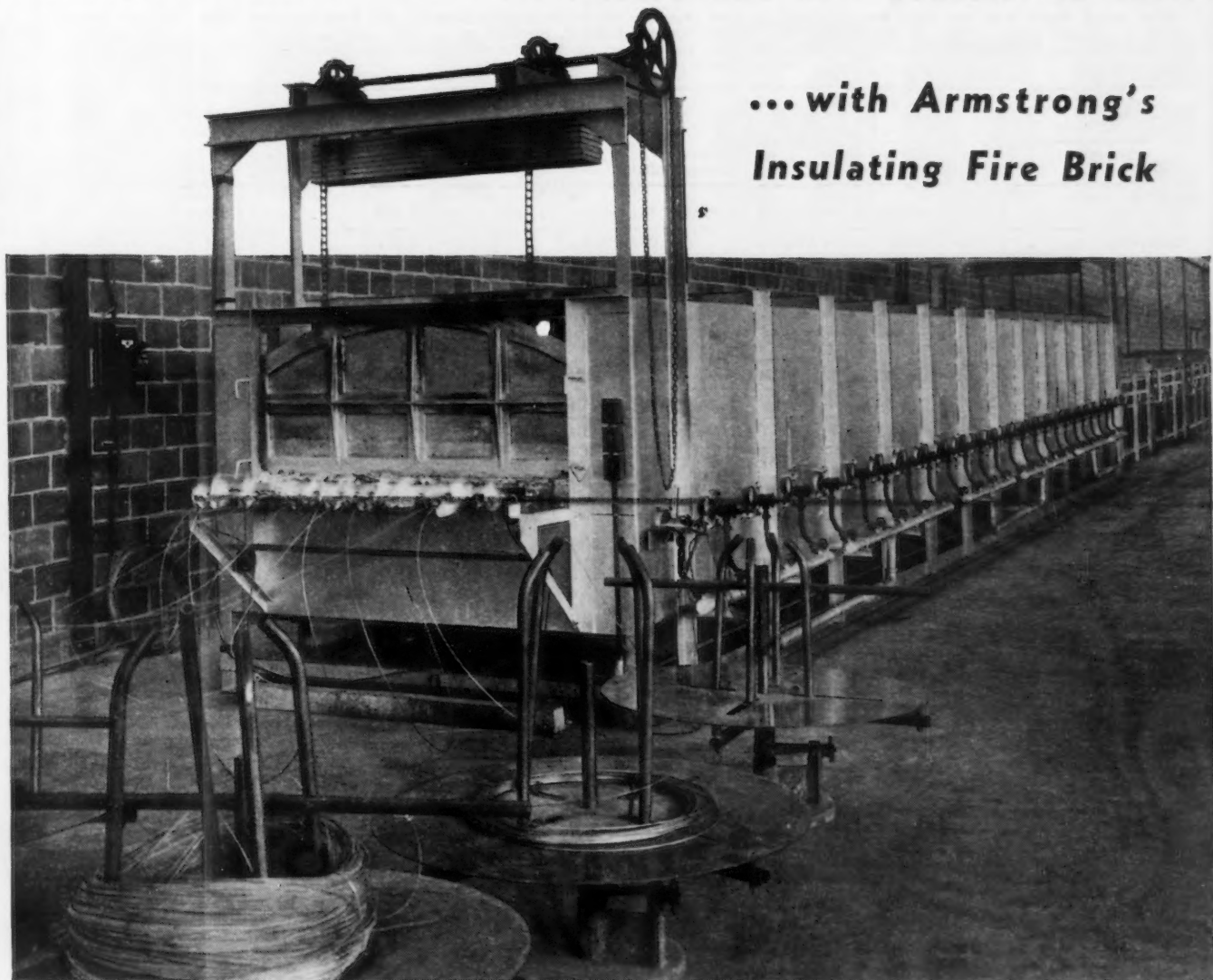
The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 132 and 136.

Composite Prices . . .

FINISHED STEEL				PIG IRON				SCRAP STEEL			
May 25, 1943	2.25513c.	a Lb.....	.....	23.61	a Gross	Ton.....	.....	\$19.17	a Gross	Ton.....	.....
One week ago	2.25513c.	a Lb.....	.....	23.61	a Gross	Ton.....	.....	\$19.17	a Gross	Ton.....	.....
One month ago	2.25513c.	a Lb.....	.....	23.61	a Gross	Ton.....	.....	\$19.17	a Gross	Ton.....	.....
One year ago	2.26190c.	a Lb.....	.....	23.61	a Gross	Ton.....	.....	\$19.17	a Gross	Ton.....	.....
HIGH				HIGH				HIGH			
1943.....	2.25513c.,			\$23.61				\$19.17			
1942.....	2.26190c.,			23.61				19.17			
1941.....	2.43078c.,										
1940.....	2.30467c., Jan. 2	2.24107c., Apr. 16		\$23.61, Mar. 20	\$23.45, Jan. 2			\$22.00, Jan. 7	\$19.17, Apr. 10		
1939.....	2.35367c., Jan. 3	2.26689c., May 16		23.45, Dec. 23	22.61, Jan. 2			21.83, Dec. 30	16.04, Apr. 9		
1938.....	2.58414c., Jan. 4	2.27207c., Oct. 18		22.61, Sept. 19	20.61, Sept. 12			22.50, Oct. 3	14.08, May 16		
1937.....	2.58414c., Mar. 9	2.32263c., Jan. 4		23.25, June 21	19.61, July 6			15.00, Nov. 22	11.00, June 7		
1936.....	2.32263c., Dec. 28	2.05200c., Mar. 10		23.25, Mar. 9	20.25, Feb. 16			21.92, Mar. 30	12.67, June 9		
1935.....	2.07642c., Oct. 1	2.06492c., Jan. 8		19.74, Nov. 24	18.73, Aug. 11			17.75, Dec. 21	12.67, June 9		
1934.....	2.15367c., Apr. 24	1.95757c., Jan. 2		18.84, Nov. 5	17.83, May 14			13.42, Dec. 10	10.33, Apr. 29		
1933.....	1.95578c., Oct. 3	1.75836c., May 2		17.90, May 1	16.90, Jan. 27			13.00, Mar. 13	9.50, Sept. 25		
1932.....	1.89196c., July 5	1.83901c., Mar. 1		16.90, Dec. 5	13.56, Jan. 3			12.25, Aug. 8	6.75, Jan. 3		
1931.....	1.99626c., Jan. 13	1.86586c., Dec. 29		14.81, Jan. 5	13.56, Dec. 6			8.50, Jan. 12	6.43, July 5		
1930.....	2.25488c., Jan. 7	1.97319c., Dec. 9		15.90, Jan. 6	14.79, Dec. 15			11.33, Jan. 6	8.50, Dec. 29		
1929.....	2.31773c., May 28	2.26498c., Oct. 29		18.21, Jan. 7	15.90, Dec. 16			15.00, Feb. 18	11.25, Dec. 9		
LOW				LOW				LOW			
1943.....	2.25513c.,			\$23.61				\$19.17			
1942.....	2.26190c.,			23.61				19.17			
1941.....	2.43078c.,										
1940.....	2.30467c., Jan. 2	2.24107c., Apr. 16		\$23.61, Mar. 20	\$23.45, Jan. 2			\$22.00, Jan. 7	\$19.17, Apr. 10		
1939.....	2.35367c., Jan. 3	2.26689c., May 16		23.45, Dec. 23	22.61, Jan. 2			21.83, Dec. 30	16.04, Apr. 9		
1938.....	2.58414c., Jan. 4	2.27207c., Oct. 18		22.61, Sept. 19	20.61, Sept. 12			22.50, Oct. 3	14.08, May 16		
1937.....	2.58414c., Mar. 9	2.32263c., Jan. 4		23.25, June 21	19.61, July 6			15.00, Nov. 22	11.00, June 7		
1936.....	2.32263c., Dec. 28	2.05200c., Mar. 10		23.25, Mar. 9	20.25, Feb. 16			21.92, Mar. 30	12.67, June 9		
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1929.....	2.31773c., May 28	2.26498c., Oct. 29		18.21, Jan. 7	15.90, Dec. 16			15.00, Feb. 18	11.25, Dec. 9		
Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 23, 1941, issue.				Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.				Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.			

SUSTAINED MAXIMUM OUTPUT

*...with Armstrong's
Insulating Fire Brick*



TODAY when every producer and fabricator of metal is pushing equipment to the limit Armstrong's Brick are helping to keep furnaces in production. These dependable insulating refractories have the stamina to give long service both in furnaces used for sustained runs and in those used for batch heating.

While helping to make possible uninterrupted production, Armstrong's Brick also aid both fuel economy and quality control. Their insulating efficiency not only saves fuel but also makes it easier to control temperatures within close limits and results in more even heating throughout the furnaces, thus protecting quality.

High physical strength, high resistance to spalling, and light weight with consequent low heat storage are service qualities common to all five Armstrong's Insulating Refractories. Their efficiency and dependability have been proved by years of satisfactory service. These brick are designed for use at temperatures from 1600° F. to 2600° F. in most furnace applications.

Armstrong's engineers with a background of 27 years' experience will be glad to give you information about Armstrong's Brick and Cements. Write Armstrong Cork Co., Insulating Refractories Department, 4905 Concord St., Lancaster, Pa.



Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates.

Basing Point ↓ Product													10 DELIVERED TO		
	Pitts- burgh	Chicago	Gary	Cleve- land	Birm- ingham	Buffalo	Youngs- town	Spar- rows Point	Granite City	Middle- town, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	Detroit	New York	Phila- delphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.22¢	2.35¢	2.28¢
Cold rolled ¹	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.17¢	3.41¢	3.39¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.75¢	3.68¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.47¢	3.73¢	3.69¢
Long ternes ²	3.80¢		3.80¢									4.55¢		4.18¢	4.14¢
STRIP															
Hot rolled ³	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.22¢	2.48¢	
Cold rolled ⁴	2.80¢	2.90¢		2.80¢			2.80¢		(Worcester = 3.00¢)				2.92¢	3.18¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.58¢	
Commodity C ₇ R	2.95¢			2.95¢			2.95¢		(Worcester = 3.35¢)				3.07¢	3.33¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	\$5.00	\$5.00	\$5.00						\$5.10					5.38¢	5.34¢
Electrolytic tin plate, box	\$4.50		\$4.50												
Black plate, 29 gage ⁵	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ ¹²			3.39¢
Mfg. ternes, special box	\$4.30	\$4.30	\$4.30						\$4.40						
BAR															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			(Duluth = 2.25¢)		2.52¢	2.80¢	2.27¢	2.51¢	2.49¢
Rail steel ⁶	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.52¢	2.80¢			
Reinforcing (billet) ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.52¢	2.55¢ ¹³	2.27¢	2.40¢	
Reinforcing (rail) ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.52¢	2.55¢ ¹³	2.27¢		2.49¢
Cold finished ⁸	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)					3.01¢	2.99¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢			(Bethlehem, Massillon, Canton = 2.70¢)				2.82¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.47¢		
									(Coatesville and Claymont = 2.10¢)						
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢		2.47¢	2.65¢	2.33¢	2.30¢	2.155¢
Floor plates	3.35¢	3.35¢									3.72¢	4.00¢		3.73¢	3.69¢
Alloy	3.50¢	3.50¢				(Coatesville = 3.50¢)					3.97¢	4.15¢		3.71¢	3.60¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			(Bethlehem = 2.10¢)		2.47¢	2.75¢		2.28¢	2.22¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢					(Worcester = 3.00¢)						
0.51 to 0.75 Carbon	4.30¢			4.30¢					(Worcester = 4.50¢)						
0.76 to 1.00 Carbon	6.15¢			6.15¢					(Worcester = 6.35¢)						
1.01 to 1.25 Carbon	8.35¢			8.35¢					(Worcester = 8.55¢)						
WIRE⁹															
Bright ¹⁰	2.60¢	2.60¢		2.60¢	2.60¢				(Worcester = 2.70¢)			3.10¢			2.94¢
Galvanized															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢					(Worcester = 3.30¢)			3.70¢			3.54¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.74¢

¹ Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. ² Unassorted 8-lb. coating. ³ Widths up to 12 in. ⁴ Carbon 0.25 per cent and less. ⁵ Applies to certain width and length limitations. ⁶ For merchant trade. ⁷ Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. ⁸ Also shafting. For quantities of 20,000 to 39,999 lb. ⁹ Carload lot to manufacturing trade. ¹⁰ These prices do not apply if the customary means of transportation (rail and water) are not used. ¹¹ Boxed. ¹² Portland and Seattle price, San Francisco price is 2.50c. ¹³ This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

GOVERNMENT CEILINGS—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices which are on another page of this issue.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote 2.35c. at established basing points, Calumet Steel division of Borg Warner may quote 2.35c., Chicago, on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.35c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote for shipment to Detroit area on Middletown base. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote 2.30c. established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all-rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. **SEMIFINISHED STEEL**—Follansbee Steel Corp. may sell forging billets at \$49.50 f.o.b. Toronto; Continental Steel Corp. may sell Acme Steel Co. at \$34 for rerolling billets plus extras and freight; Ford Motor Co. may sell rerolling billets at \$34 f.o.b. Dearborn; Andrews Steel Co. may sell forging billets at \$50 at established basing points and slabs at \$41; Empire Sheet and Tin Plate may sell slabs at \$41 at established basing points and sheet bars at \$39 f.o.b. mill; on lend-lease sales Northwestern Steel & Wire Co. may charge \$41 per gross ton f.o.b. mill for rerolling billets; on lend-lease sales Wheeling Steel Corp. may charge \$36 per ton for small billets, f.o.b. Portsmouth and \$37 per ton for sheet bars f.o.b. Portsmouth; Laclede Steel Co. on semifinished sales for lend-lease shipped to eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. **ALLOY STEEL BARS**—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.